THE

AMERICAN NATURALIST

VOL. XXIV. NOVEMBER, 1890. 287.

A PICTOGRAPH FROM NOVA SCOTIA.

BY J. WALTER FEWKES.

IN the course of some studies of the language of the Passamaquoddies, made last spring, I was shown by Mrs. W. Wallace Brown, of Calais, Maine, an interesting collection of "squeezes" of Micmac pictographs from Fairy Lake, New Grafton, Nova Scotia. The adornment of the head of several of these interested me considerably, as it seems to impart information in regard to the manners and customs of the Indians who probably made these figures. The cut which is here given is an exact reduction of the squeeze of one of the pictographs to which I refer.[1] The original is remarkable in several particulars, but more especially in regard to the strangely-formed, cap-like figure on the head.

The pictograph considered in this paper is supposed to be an old one, and to have been made by an Indian, probably of the Micmac tribe. Several of the squeezes in the collection appear to have been made after the white man, either by Indians or by the white men themselves. There are representations of ships or vessels with sails, which would point to a modern origin, and one of a human figure with a gun, which cannot antedate the advent of the whites, but there are still others which are so closely allied to other Indian pictographs found elsewhere that they are probably

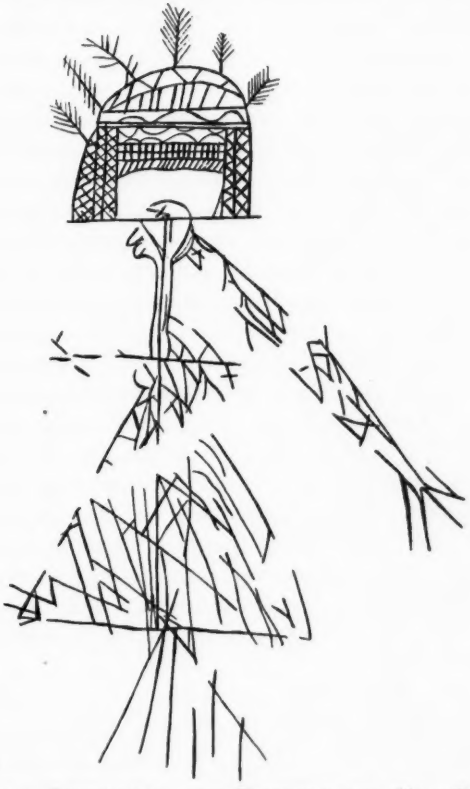
[1] My figure is an exact copy of the squeeze with all its imperfections. I have never seen the pictograph itself and cannot say whether the breaks in the lines, especially on the body and hair, exist in the original or not. It look as if the squeeze was imperfect at these points.

veritable Indian productions. The occurrence of old and new together is what might be expected. There is an almost involuntary tendency to add one's name to a wall where others have placed theirs. Many examples of this might be mentioned; for instance, Inscription Rock, on the road from Acoma to Zuñi Pueblo, New Mexico, bears side by side Indian pictographs, ancient and modern, and the names and dates of visits of travelers, from the end of the sixteenth to the nineteenth century. The fact, therefore, that there are some modern pictographs associated with the one we are considering does not mean that it also is modern. While the style of the dress might suggest modern times after association with the whites, the remainder of the pictograph has an ancient look which is suggestive.

While it must be confessed that the explanation of these head-dresses proposed in the following lines is conjectural, there is evidence which seems to support it. Evidently these pictographs represent some costume with which the maker was familiar, and can hardly be called fanciful. A pictograph of an Indian with a gun, or a ship with sails, both of which are represented in the collection, affords inherent evidence of the modern origin of the pictograph. It would seem, if the same were not true of undoubtedly ancient pictographs, that the form of the dress of the figure represented in the cut recalled the skirt of the white woman, yet the general character of the pictograph indicates its age, as ancient pictographs with the same form are not unknown. If an ancient pictograph, the form represented in the head-dress must have been a familiar one to the graver. Analogy with other pictographs of known significance, rather than exact knowledge, would lead me to interpret this as a mask or head-dress worn in the dance or on festal or religious occasions.

I have seen at the Indian settlement at Pleasant Point a head-dress ornamented with feathers, which is kept as a curiosity of the olden time; and it is known that in olden time our New England Indians wore such ornaments. Yet I am familiar with but few representations of pictographs of head-dressed ornamented with feathers which are as elaborately delineated as those cut on the rocks of Nova Scotia, of which a cut is here reproduced.

In trying to discover the meaning of this representation I have not been able to satisfy myself that its significance has been correctly, or at least satisfactorily, interpreted. It seems improbable that it was intended to represent a head-dress such as have been taken from the skulls of Indians which have been exhumed at



MICMAC PICTOGRAPH, WITH PROBLEMATICAL HEAD-DRESS.

certain points on the neighboring coast of Maine. While in form it distantly resembles the pointed caps which the Micmacs and Passamaquoddies wore in recent times, it seems but a rude representation of such, and one which an Indian would hardly have sketched in the relative form and size represented.

The interpretation which has suggested itself is as follows: The likeness to a dance-mask or dance-tablet is so close that the possibility of its being a representation of some of the paraphernalia of the dances occurred to me. Familiar with similar masks and elaborate tablets borne on the head by the Pueblo Indians at the present day in several of their ceremonial dances, the likeness of the appendage represented on the head of the Nova Scotia pictograph suggested that it might have a similar sacred importance. It is not uncommon to find dance-masks represented in the pictographs made by the Indians. The pictographs of human faces which one finds in such abundance in the neighborhood of Zuñi Pueblo, New Mexico, often represent those personages who take part in the sacred dances. This is more especially true where human beings are represented, and it is not rare to find heads of *Kō kōs*, of *Sha'la'kos*, and even of the *Ko'yea'mashe*, represented so truthfully that they can be readily recognized. It is not uncommon to find the masks alone of dancers represented, and it is believed that in all such cases there is a certain religious significance in the pictograph, and a sacred meaning in such representations. Such also, it may be surmised, is the meaning of the figure portrayed in the Micmac pictograph. We may have here a representation of an old dance-figure wearing on the head a mask not unlike the masks still carried by the tribes which have preserved to the present day their ancient religious rites. If this interpretation of the head-dress of the pictograph from Nova Scotia is a correct one, as seems plausible, it may give us an insight into the character of the dress of the dancers in ancient Micmac ceremonials.

I have also seen, in the same collection above referred to, pointed rectangular pictographs, with one side inclined to the other, which would also seem to be representations of former head-dresses for use or ornament. Some of these are represented elaborately ornamented with cross-lines, as in our figure, and some are surmounted with feathers, as in the pictograph represented in the cut. Isolated examples of these are often cut on the rocks, while their frequency would indicate that they have a meaning of some kind. We often find in the collection the same rectangular structure on the heads of human figures, but

quite as often the head-dresses are represented alone. It seems hardly probable, if they represent simple caps or hats, that the Indians would take the trouble to cut them on the rocks in the elaborate way in which they occur; but if they represent paraphernalia of the dance one can readily suppose that they would be thus carefully represented.

Moreover, we find among many tribes that the custom of cutting pictographs of dance-masks and other head-dresses which are used in religious ceremonials is a common practice, as any one who has studied the pictographs in the Southwest may attest. I would therefore suggest that in the figure represented in the cut we have a picture of a Micmac wearing a mask possibly worn in sacred ceremonials.

The long appendage to the head is interesting. It is supposed to represent the hair tied up in the ancient fashion. In old times the Passamaquoddy Indians, more especially the squaws, tied their hair on a flat plate, sometimes of shell, on the edges of which were holes through which a string was woven. There is an old folk-tale of the Passamaquoddies in which a string made of eel-skin was used for this purpose. Possibly we have represented in the cut a similar method of doing up the hair formerly used by the Micmacs and Passamaquoddies.

While it is not the purpose of this communication to comment on, much less discuss, the antiquity of the New Grafton pictographs, some of which are undoubtedly modern, it must be said that there are evidences of antiquity in many particulars as far as many are concerned. Through the kindness of Mrs. Brown, I have in my possession the squeezes of several of those which seem to indicate an ancient origin as far as the subject treated is concerned. It is one object of the present communication to call attention to the possibility of gathering some information in regard to the former customs of the ancient aborigines of Nova Scotia, New Brunswick, and New England from the picture-writings which they have left behind. The locality in which the pictograph represented in the cut is found is particularly rich in ancient picture-drawings, and would, I should judge, repay a careful, systematic exploration and study with this thought in mind.

THE EVOLUTION OF MIND.

BY E. D. COPE.

(*Continued from page 913.*)

IN the provision and care for the young animals display a great fertility of resource, beginning low in the scale. It is well known that certain Siluridæ (catfishes), Gasterosteidæ (sticklebacks), and Percidæ (sunfishes) of North America make nests for the reception of the eggs, and that they take care of the young. It is not an uncommon sight, in suitable places in our country, to see the catfish, *Amiurus nebulosus*, lead about its shoal of young fry like a hen with her chickens. Other Siluridæ of South America take the eggs in the mouth, and so protect them. In these and similar cases we may imagine that the animal regards the eggs and young as part of itself, to which it attaches a certain value, as in ordinary self-preservation.

Such an explanation serves in the case of the ants and bees, which show such care of their young. Some of the most remarkable cases of this kind are to be found in the Batrachia Salientia, an order not distinguished for intelligence in any other direction. In some parts of South America and Africa, where there is a dry season, certain tree-frogs deposit their eggs in masses on the branchlets and leaves of trees that overhang the dry beds of streams. The surface of the gelatinous albumen, in which the eggs are enclosed, hardens by evaporation, so that the latter are well protected. On the arrival of the rainy season, the stream below the nest begins to flow, and the nest is dissolved and washed into it, so that the larvæ can pass their branchiferous larval stage successfully. It is interesting to note that the species which adopt this habit are not closely allied in a systematic sense, the African belonging to the Ranidæ, and the South American to the Hylidæ. They have learned the habit independently of each other. Another tree-frog, of unknown species, inhabiting Japan, has been shown by the Rev. W. S. Holland to construct a

similar nest, but of a larger and less solid character. The interior remains semi-fluid, and the eggs hatch and the young pass there a part at least of their larval life before dropping into the stream below. The region is not subject to drought, so that the object of this habit may be to escape enemies which may lurk in the water.

In South America certain Hylidæ (Notrotrema, Opisthodelphys) and Pipidæ (Pipa) adopt the habit of placing the eggs on the back. The former mostly inhabit a region which suffers from drought,—the western slope of the Andes. They retain the eggs in an invagination of the dorsal integument until they are hatched, and in some cases until they have passed their metamorphosis.

In the genus Dendrobates (Dendrobatidæ), also South American, the tadpoles are carried over land on the back of the parent, attached by their mouths, to a new pond, when the old one dries up. The most peculiar modification is that adopted by the *Rhinoderma darwinii* of Chili (fam. Phryniscidæ). The male takes the eggs into his vocal sac, which is entered from the floor of the mouth. This sac is greatly extended in this species, reaching below the entire abdomen. Here the eggs hatch, and the tadpoles remain till such time as they complete their metamorphosis. As in the stickleback and the catfish, this is a case of paternal instinct.

The intelligent efforts of certain birds to divert the attention of enemies from their nests are well known. Two prominent cases of this kind in North America are the woodcock (*Philohela minor*), and the oven bird (*Siurus aurocapillus*). The flutterings of these birds along the ground, apparently in easy reach of the grasp of the pursuer, lead the latter far from the nest. When safety is assured, the bird flies away unharmed. The two species mentioned have no zoological affinity with each other, so that they have adopted the habit independently.

In the capture of prey animals often show a remarkable knowledge of the physical characters of the latter. Thus the ophiophagous snakes seize venomous species by the muzzle, thus keeping their mouths closed and preventing their biting. The wonderful habits of the species of mud-wasps in this respect

have often been observed. They capture the species of insects and spiders which they store for the use of their young by stinging them in the nervous ganglia in such a way as to paralyze without killing them, thus preserving them alive for many months.

The construction of webs by spiders furnishes an excellent illustration of the progressive development of a capacity for mechanical construction. The inferior forms construct loose nets in the grass. Another type adds to this a funnel-shaped retreat, in which they lie in wait. A higher form suspends a triangular net between the branches of a bush, while the perfection of the art is reached by such Epeiridæ as spin a complete disc composed of many triangular segments, which often contains a staircase from the centre, arranged for their ready escape from an enemy. At some early period in the history of the spiders an intelligent perception of the utility of a web in the capture of prey must have been attained. The habit of making the web has become ingrained or instinctive, and has by use absorbed the faculties of the species. Accident has perhaps led to the habits of constructing them differently with relation to the environment, such as the surface of the ground, etc. The triangular form is the simplest possible device for a suspended web, while the discoidal web is constructed by a simple repetition of the same device. This probably means merely increased capacity for web-construction; that is, increased secretion of web-substance, and increased nervous activity, both the result of use.

The intelligence displayed by the higher animals in the capture of prey is well known. I once had a tame raccoon which was fastened by a chain of moderate length in a stable. He frequently attempted to catch the chickens that entered the stable, but was prevented by the shortness of his chain. But he adopted a device which was successful. He collected the remains of his meals within the circle of which his chain formed the radius. He then pretended to go to sleep at a point near the the centre of the circle, while he slyly watched the birds. The latter approached, and, becoming confident, proceeded to peck at the fragments. The raccoon then easily pounced upon and caught them. In the pursuit of their prey dogs, as is well known, display much

intelligence. Some of them anticipate the arrival of deer, which run in a circle, by cutting across its diameter and reaching a point in advance of them. In the same way foxes show remarkable intelligence in their endeavors to escape from dogs in pursuit. They double on their own tracks, and run in water to destroy and confuse the scent. These actions show reasoning capacity of a very respectable order.

The Hymenopterus insects display the most remarkable powers of self-preservation and protection through social organizations. This intelligence was probably reached at some early geologic age, and it has been followed by remarkable consequences, both to themselves and to other members of the animal, and not less to the vegetable, kingdom. It may be truly said that man himself has produced no such important constructive effects on other organic beings, although his destructive effects have been probably greater. In the first place, the habits of many of the order in seeking their food in flowers have probably been the active agency in determining the forms of many of the latter, as well as of developing the nectariferous glands and increasing their secretion. This view was suggested by Müller and myself at about the same time, and has been elaborated by Henslow in one of the volumes of the International Scientific Series. In the next place, a number of animal types have been called into existence through the food and protection offered by the domestic economy of the ants. Among Vertebrata we have three families which live in ants' nests, all of which have become blind or nearly so, and two have lost their limbs, through the adoption of their parasitism on ants. Such are the Cæciliidæ (Batrachia), Amphisbænidæ (Lacertilia), and Typhlopidæ (Ophidia). Then many birds (Formicariidæ) live on ants and Termites, and two families of Mammalia, the Myrmecophagidæ in South America, and the Orycteropodididæ in Africa. Thirdly, the ants have domesticated numerous species of insects which they use for their secretions and for other purposes. In Europe about one hundred such species are known. The slave-making habits of various ant species are well known. This habit has been so long existent in certain species that the latter cannot exist without the aid of

their slaves. The latter care for their young, and even procure food for the adults. This habit is an illustration of a misdirection of intelligence. Originating in an intelligent appreciation of what the slave ants could do for them, they have become so dependent on the latter as to have lost some of the most important functions of self-preservation, so that their persistence in future time is necessarily more precarious than that of any other type of ants, *cæteris paribus*.

The fact that the practice of stirpiculture and social division of labor, with the laying up of food supplies, has developed independently in three different phyla is of much interest. These habits are exhibited by the Formicidæ and Apidæ of the order Hymenoptera, and by the Termitidæ of the Neuroptera.

The habits of the beaver display intelligence in two directions. They adopt an effective measure of security in building their dams so as to flood the entrances to their houses, thus protecting themselves from many foes. Secondly, they display mechanical skill in the construction of the dams, and in the location of their houses.

Some of the monkeys are the most intelligent of the animals below man. I had in confinement for several years three species of the South American family of the Cebidæ, which stands lower in the scale than the monkeys of the Old World. One of these was an Ateles, and it was rather stupid. The others were the *Cebus capucinus* and the *C. apella*. The former was the more intelligent. I have already referred to the tendency of these species to syncope under extreme fear. The *C. capucinus* possessed unlimited curiosity. Everything that came into its possession was closely scrutinized, and would be broken up, if possible, and the interior examined. It used sticks and stones for its purposes, much as is done by man. With the former it reached for objects not otherwise attainable, and in their absence would unfasten the leather strap that passed round its waist, and whip in desirable objects by throwing the free end round them. Sticks were used in defence, and were either thrown or held in the hand by one end. Pounding the shining sconce of a bald-headed friend was an amusement for which it was always ready. It threw stones

with considerable precision, overhand. Stones were also used for cracking nuts and other objects, and when the latter were resistant, it would leap in the air and bring the stone down with great force, and with many grotesque attitudes and grimaces.

It would draw bolts, lift hooks, and pull out nails which closed the door of its cage. I never knew it to open a buckle correctly, but it would pull out the threads which fastened the fold of leather which held the buckle, and so free itself from the strap. On one occasion it imitated the use of the drawing-knife by carpenters who were at work in the room in which its cage was kept. It secured a square rod of wood, and some fragments of sheet tin which had been left near its cage. It carried the wood to a shelf in the cage and sat on it, letting it project forward from between its legs. It took a piece of tin in both hands, and placing the edge across the wood, drew it rapidly backward and forward on the latter, just as the carpenters use the drawing-knife. This action it repeated frequently, with many grimaces and expressions of delight.

It was very expert in the management of its chain. It carried it in a coil of its tail over obstructions and objects on which it was likely to be caught, quite as carefully and successfully as could have been done by a human being. In this it showed its intelligence to be superior to that of dogs, cattle, or horses, who will wind themselves up when tied, and cannot unwind or extricate themselves.

In all these exhibitions the Cebus displayed predication, or conception of the consequences of certain causes; *e.g.*, the effect of being wound up, and the effect of carrying the chain in relation to its environment.

The Cebus was evidently conscious of wrongdoing. When detected in some particularly mischievous proceeding his furtive and downcast looks showed that he understood the nature of the act, and that before any word was spoken. He perfectly understood the tones of voice of his master, showing alarm or satisfaction as the case might be. In attacking a strange animal, as a dog, cat, or chicken, he always waited for the word of command; on receiving it he would spring towards the enemy with loud

ejaculations of hostility and open mouth, looking frequently to his master for approval.

When inclined to be sociable he made rapid movements of the jaws and lips as though endeavoring to talk, an appearance which was increased by the attitudes of the head and the inquiring expression of the eyes. The same habit is to be observed in the Old World monkeys, as in Cercopitheci and baboons. It appears to be one of the preliminary endeavors which in the ancestors of man led to the function of speech.

Deliberation and Judgment.—The condition of deliberation is a restraint of intended action in view of alternatives and uncertainties. This attitude of mind requires attention. As such action involves an intention, more or less distinct, it presupposes also an inductive basis of knowledge, and a deductive application of the same in practice.

Attention is commonly observed in animals, even of the lower types. A slight stimulus, as a sound, will arouse it, and it will be often continued long after this stimulus has ceased. This is commonly observed in Mammalia and in birds. It is well exhibited by tortoises and by snakes. The snake-like lizard, *Opheosaurus ventralis*, is easily tamed, and displays careful attention to the movements of its master.

Deliberation is seen in the careful selection of a suitable place for the deposit of eggs by a great many animals. Urged on by the emotion of egg-laying the animal restrains its desire until a place is found when the precious property can be safely concealed from the eyes of enemies. This kind of deliberation is seen as far down as the fishes, and the insects probably exhibit it as well. It is also seen in the careful examination of articles which may or may not be edible. Monkeys are untiring investigators, and they often scrutinize and critically taste objects with an evident view of ascertaining their character as edible or not. Carnivora pursue the same object by the use of the sense of smell. Fowls and other birds often deliberate over a doubtful object.

A dog will deliberate as to whether another dog or another animal is hostile or dangerous or not. An amusing illustration of this faculty is seen in the close consideration which a dog will

give to an insect which more or less resembles a bee or wasp. I have seen a bull-dog examine with care a large fly which resembles a bee, and evince much doubt as to whether it might be safely snapped up or not. When urged to attack the dog would do so with lips retracted and dripping with saliva, so that the teeth only might come into contact with the suspicious insect. This amusing illustration is well represented by a Belgian painter in a picture exhibited at the Paris Exposition of 1878.

In forming a decision on deliberation an animal performs an act of judgment. Like a concept, a judgment may be very simple or it may be complex. Its grades depend exactly on the grade of the percepts or concepts which are compared. But whether simple or complex, the formation of judgment is a metaphysical act. It results from a comparison of memories of percepts, or of generalizations derived from concepts of all degrees of generality.

Self-Consciousness.—This is a grade of consciousness which is probably found only in the human species, and is probably wanting to the lowest of human races. It is the introspection which occupies itself with one's own mental states. It more frequently occupies itself with past than with present mental states, for man is not accustomed to reflect on the character of his own mental acts when in action. He is conscious of them, as he is conscious of the movements of his own body, and he may also be as unconscious of the one as he is of the other. Moreover, self-consciousness may extend to the simplest mental acts as well as to the most complex. Hence I cannot agree with Mr. Romanes, who makes self-consciousness the condition of the formation of a concept. Nor can I think he has used the word subject in the usual sense when he restricts it to the self-conscious mind. The subject is that which is conscious in any degree, as distinguished from object, which is that of which the subject is conscious. So the insect, feeling pain, is quite as much a subject as a self-conscious man. Self-consciousness is a form of consciousness possible only to the highest grade of intelligence. In its exercise the subject becomes an object, when it is well termed the "subject-object." We have no certainty that any animals pos-

sess this capacity, but it is quite possible that some low types of men rarely or never practice it. This we may derive from their vocabularies, from which words expressive of introspective mental states are absent.

Consciousness of one's body and of one's mental sensations is no doubt present in animals. This is, however, simple consciousness, and not self-consciousness. Animals also possess consciousness of the mental states of other animals and of men. This is an inference based on their appearance, gestures, tones, etc., and one more evidence that many animals possess the rational faculty of induction or inference.

4. THE METHOD OF MENTAL EVOLUTION.

That the highest type of mind, as seen in mankind, has been produced by a process of evolution by descent from primitive beginnings would seem to follow from the history of the organism which displays it, *i.e.*, the nervous system and its ganglia. Whether there is any insurmountable obstacle in the way of such a belief will be considered in the present section.

We have traced the existence of various component elements of mind among the lower animals, and have found that the only quality which is not common to them and to man is that of self-consciousness. And of this there is doubt as to its existence in the lowest human races. We have, however, recognized that the animal mind cannot reach so high a grade of conception in the classification of the mental contents, as can man. But we have seen how very greatly human minds differ in this respect, so that there may be said to be a rising scale of mental organism from the lowest animal to the highest man, with but a slight interruption at the point where we pass from the highest ape to the lowest man. This slight interruption is due to the advent of language, which gave the mind a new machine, by which its power of accumulating experience was increased, and a firm hold over its conceptual faculty acquired. The very inferior quality of the minds of the lowest races, however, leads us to infer the former existence of still less intelligent men, and their extremely simple languages lead us to suspect that the time was when man devel-

oped language from inarticulate sounds and gestures, precisely as he has since developed new complexities expressive of the progressive advance of his mental power.

Mr. Romanes, in his work on the "Origin of Human Faculty," has been at great pains to examine and elucidate the question of the origin of the human intelligence, and I cannot do better than refer my readers to it as the best exposition of the subject in existence.

The experiential theory adopted by Locke as a statement of the history of the human mind has been shown by Herbert Spencer to be more correctly an explanation of the development of the mind of animals in general, including that of man. On this hypothesis, while it is admitted that much may be acquired by each individual human mind by experience, it is asserted that more has been acquired by the race in general, and handed down to the existing generations by inheritance. It is further held that the elements of the mind of man were not acquired by him at all, but have been derived by him by inheritance from the preëxistent members of the animal kingdom from whom he is descended. It is the qualities which are thus inherited which appear to the student who is unacquainted with this explanation of their origin to be spontaneous, or "intuitive" to the human mind. Thus the so-called intuitions of man are shown to be the organized products of the experience of preceding generations. The question of the origin by experience of the powers of thought of man is quite independent of the metaphysical question as to whether a given truth is contingent or necessary. The former may depend more directly on experience than the latter, but the capacity to apprehend the latter is as necessary a result of evolution as is the capacity to apprehend the former, if the evolution of the human mind be admitted. Of the truth of this mode of explanation of the origin and growth of the latter there seems to the present writer to be no doubt.

As sensation appears to be present in some or all of the Protozoa, without corresponding organs of sense, general or special, we believe that their protoplasm or part of it is endowed with a diffused conscious sensibility. Organs of a special sense, sup-

posed to be sight, are present in many Infusoria in the form of small aggregates of red or black pigment. From such a source organs of developed sight can be traced, the subsequent additions of retinal nerve supply, humors, etc., having been observed in animals of successively higher types. Thus we have ground for believing in the evolution of this form of special sense step by step.

General sensation is immediately localized on the appearance of special organs for its activity. These are the threads and bodies, termed nerves and ganglia, which appear first in the ascending scale in the Cœlenterata. From the simple structures presented by the jelly-fishes we trace the successive evolution of the nervous system up to its highest expression in the Mammalia and in man. Thus we have the physical basis of the evolution of sense-perception plainly before us. The belief in the evolution of the more complex forms of perception from simple consciousness is therefore inevitable.

The evolution of ideation may be traced along the lines of the affections and of the intelligence. The affections differ among themselves in degree of intensity as well as in kind. In their simplest form they are mere preferences, or likes and dislikes; in a more pronounced type they are the affections; while in their forms of greatest intensity they are the passions. The evolution of the emotions is therefore quite comprehensible under the direction of use and experience. Profitable use develops strength, while experience of the evils of unprofitable use develops restraint and disuse. The desires and affections furnish the stimuli to action, whence comes experience, and therefore ratiocination. Reason, in turn, furnishes material to the affections, and also guides them to the accomplishment of their desires.

It is evident that without consciousness the development of ideation would be impossible. Ideation is a result of education or the experience of pleasures and pains. The appetites are conscious states, and they furnish, with general and special sensation, the basis of the knowledge which animals possess of the material world. Granted consciousness, and the progressive development of ideation is necessary, except in certain cases where degeneracy

is exhibited. The changes of the seasons, the periodicity of the appearance of vegetable food, the irregular production of animal food, the struggle for existence between animals themselves, all furnish the materials of memory, and the stimuli to emotion, attention, conception, induction, and all forms of mental activity. By means of memory these results are cumulative; and by reason of the effects of these activities on structure of the nervous centres the faculties themselves are augmented in power, and may become finally automatic, or be performed without the presence of consciousness. Such automatic acts or habits may become so fixed as to be surrendered with difficulty, or not at all, after changed circumstances render them no longer beneficial. They are termed instincts, and for a long time an essential difference was believed to exist between Instinct and Reason. But it is now evident that man possesses the primitive instincts in common with the lower animals, and various tribes of men display especial characteristics which have become congenital, and may be properly termed instincts. Such are the habits of a nomadic people, which they give up with great difficulty. Such is the instinct for the chase which persists in some men so that they move ever further off the frontier of a more sedentary civilization. Since it is known that many of the lower animals can reason, the supposed distinction between Instinct and Reason disappears entirely.

As in structural evolution, ontogeny furnishes us with a guide to phylogeny. The study of the growth of the infant mind throws much light on its general evolution. The primitive condition of the emotions is that of appetites. The first of these in the necessary physiological order, and hence in time, is the appetite of hunger. Second in order in the history of life, but not in the growth of individuals, is the instinct of reproduction, such as it is in animals who only multiply by fission. Very early in evolution the emotion of fear must have arisen, and it is probably the immediate successor of hunger in the young of most animals. Anger appears as early as the mind can appreciate resistance to its first desires, and no doubt followed as third or fourth in the history of evolution. The rudiments of parental feeling would follow the origin of reproduction at a considerable interval of

time. One of the latest of the instincts to appear would be the love of power; while later still would be the emotions of relativity (Bain), because they are dependent on a degree of mental appreciation of objects. Such are admiration, surprise, and wonder. These, as well as all other consequences of inherited intellect, appear earlier in infancy than they did in evolution, by the process of "acceleration," as may be readily understood.

Of these instincts and emotions it is to be supposed that hunger remains much as it has ever been. The reproductive instinct has, on the other hand, undergone the greatest modifications. Sex instinct could not have existed prior to the origin of the differentiation of sex. Hence it is probable that the parental instinct preceded the sexual in time. These two instincts, being the only ones which involve interest in individuals other than self, furnish the sources of sympathy in all its benevolent aspects. Hence it has developed in man into the powerful passion of love; into affection and charity in all their degrees and bearings. Fear being, as Bain shows, largely dependent on weakness, has varied in development in all times, but must be most pronounced in animals of high sensibility, other things being equal. Hence its power has, on the whole, increased until it probably reached its extreme in the monkeys or the lowest races of men. Increasing intelligence of the higher order diminishes the number of its occasions, so that it is the privilege of the highest type of men to possess but little of it. The earliest of the emotions of relativity to appear in time has probably been the love of beauty; how early it may have appeared it is difficult to imagine. Surprise and wonder, as distinct from fear, one can only conceive as following an advanced state of intelligence.

Thus in psychology the paleontological order of development is somewhat different from the embryological. I have compared the two orders as follows: *

PALEONTOLOGICAL.	EMBRYOLOGICAL.
Hunger.	Hunger.
Reproduction.	Fear.
Fear.	Anger.

* AMERICAN NATURALIST, September, 1883.

Anger.	Beauty.
Parental instinct.	Wonder.
Sex.	Power.
Power.	Pity.
Beauty.	Sex.
Wonder.	Parental instinct.

The qualities enumerated in the first column follow each other directly in order from the simple to the complex. In the second column this order is disturbed by the earlier appearance of the derivative emotions, beauty, wonder, and pity or benevolence, and the later appearance of the simple emotion of sex. Thus in psychological as in other evolution some of the products of development appear earlier and earlier in life in accordance with the law of *acceleration*.

It is evident that a capacity for ideation has been developed, which is capable of conception or generalization. This is seen in the capacity which animals frequently display of adapting themselves to new situations. This is accomplished by the conception of the general resemblance of the new case to certain old ones, although there may be much difference in detail. Thus Mr. Belt tells of an army of ants on the march which crossed a railroad track on which cars were frequently passing. The wheels crushed the ants as they crossed the rails. This was observed by the ants, who at last escaped the danger by burrowing under the rails. Mr. Beaumont relates that some Termites which he had imprisoned in a glass jar with perpendicular sides escaped from it by an ingenious use of a secretion of their bodies which they ordinarily used in building their nests and covered roadways. The soldiers furnished the workers with a semifluid cementfrom their bodies, which the latter deposited on the glass, where it hardened. They thus made a roadway to the top of vessel, over which the insects passed out. The faculty has plainly developed from the simple to the more complex. The difference between the dart-throwing of the Infusorian Dinidium and the dam-building of the beaver is one of degree only, and not of kind. The difference of degree resides in the more numerous means necessary to the beaver's act than to that of the Dinidium.

The latter throws only its own indurated cilia; the beaver uses the earth for burrowing, the water for covering, and the timber for building both the dam and its house. The more complex the performance the more likely is the animal to employ also the deductive act. Thus in the case of the building of nests by birds and trap-door spiders, when customary materials are wanting, new ones are adopted; that is, a known rule as applied to new cases.

The manner of the evolution of the concept has been as follows: The sensible qualities of objects are first learned, and stored in the memory. The qualities must be distinctly localized in the nervous centers, otherwise confusion of memory would result. Thus if a red bird is perceived to sing on a tree four distinct perceptions are experienced. First, a bird's form; second, a red color; third, the song of a bird; fourth, a particular tree on which the bird was perched. It is not probable that that part of the nervous center which perceives form is identical with that which perceives color, nor either with that which perceives sound. The constituent parts of the center have become specialized into different regions, each capable of apprehending a different quality. Each locality is blind or deaf, as the case may be, to that stimulus which affects the other, although all may be alike reached by the vibrations, or whatever the form of stimulus may be, which is derived from the common source. And each is so joined by connecting nervous threads with all of the other localities, that the general idea of the entire object is not lost. Thus we may believe that there is a localization of the sense of form, where forms are recorded, and may be compared and their identity or difference be consciously known. In simple minds identity would be often perceived, and slight differences be disregarded. Hence the simple conceptions of the animal mind. In more advanced minds, with greater specialization and organization of structure, minuter differences, as well as wider resemblances would be recorded, and would enter into consciousness. The combination of percepts form the lowest grade of concepts. Still higher development would render possible wider combinations through the development of nervous connections between more

widely separated localities of record, and their conduction to added portions of the center or locality of gray tissue, where consciousness would necessarily perceive the resemblances and differences thus set before it.

Finally, the lower concepts thus gathered from perceptions could be transmitted to a functionally still higher center, where their resemblances and differences should become obvious to consciousness, and the highest concepts, inductions, or judgments result.

In the tracing of the development of this mechanism and its function, I once more call attention to the fact that without the presence of consciousness the whole process is useless as a mental evolution. I must consider later the question as to how or why the specialization or location of sense-perception should take place. That it actually exists has been demonstrated by the researches into brain and cordal physiology conducted in recent years.

Leaving for a moment the question of the physical basis, I revert to the metaphysical side of evolution of mind. It is generally admitted by evolutionists in the field of psychology that experience is the immediate agent of such evolution; or, in other words, that it is a process of education, the possibility of such education being dependent on consciousness and memory. There is here no ambiguity as to the method. Consciousness is educated by the direct action of the environment as determined by the active or passive condition of the organism. In other words, the environment impresses itself directly on the consciousness of the organism, and a memory remains, which is the guide to the future movements of the latter, and this process has been in operation ever since life has existed, and the result has been the human mind.

We have here no promiscuous or fortuitous activity of sensation, nor is any possible, since sensations are only produced by a stimulus from a definite material source. There is no "survival of the fittest" at this stage of the process, but a calling into being of new sensations, and consequently of new movements. Here we have the origin of mental changes distinctly before us, and the question of their survival comes up at

a later stage of evolution. Responses to stimuli are, however, necessarily "fit" or appropriate to the stimulus, and it can only be other features in the environment which can make them otherwise. And this unfitness cannot continue,—not because its possessor is necessarily destroyed, but because new environments produce new sensations and new educations. It is therefore in the evolution of mind that the doctrine of natural selection breaks down completely, even as a directive agent. As an originative method it has no application.

We have now reached the keystone of the arch of evolution, so to speak, and we can retrace our steps over the ground of the origin of structure, with which we commenced. The next question which we have to discuss is that of the effect of mental conditions on the movements of organisms.

THREE CASES OF HYPOSPADIAS IN WHICH THE SEX WAS UNDETERMINABLE UNTIL PUBERTY.

BY DRS. L. H. AND W. H. LUCE.

THESE cases are chiefly interesting from the fact that they all occurred in one family; and on account of the slow evolution of the organs continuing after birth up to puberty.

The cases, the subject of this article, consisted of three of six children. The parents were of normal development physically, but of strong nervous temperaments, there being cases of insanity on both sides,—the father on the paternal side, and nieces on the maternal side. The father was a sea captain (whaling), intelligent, of indomitable courage and great energy. The mother was also intelligent, and above the average in courage and energy, belonging to a large family of sturdy sea captains celebrated for their hardihood. The two did not live happily together; the wife, it was said, was frequently the subject of maltreatment at the hands of her husband *during her pregnancies*. There were no cases of deformity or deaf mutes in any of the ancestry on either side,

though there are two deaf mutes in the family of a brother on the husband's side. Of the five children born in this family, three were boys and two were girls. The sex of two of the boys and one of the girls was undetermined at birth, and was not fully determined until puberty, the boys during the intermediate period *receiving girls' names and wearing female apparel.* They attended school dressed in female attire, and sat on the girls' side. About the age of puberty they were suddenly sent away to school, still dressed in female attire and bearing female names. In due time they returned, *dressed in male attire and bearing male names.*

In after years they were married, and a suit brought by the wife of one, charging "that her husband was not a male," enabled me to make a careful examination of the genital organs in order to establish the fact whether he was or was not a male. I may say, *en passant,* that the suit was granted by the court on the ground that although a male he was not capable of procreation.

The examination disclosed the following: *General appearance:* That of an unusually well-developed and handsome man, five feet eleven inches in height, weighing 180 pounds. Of a nervous-sanguine temperament. Face at this time hairless. Breasts normally developed.

Genital organs: A deep sulcus extending from the pubes to the perineum; in fact, occupying the place of the external organs of generation of the female. *Posteriorly* it terminated in a cul de sac, sufficiently deep to admit two fingers to the depth of two inches. *Anteriorly* was an abnormally-developed clitoris, two and one-half inches in length, having a glans and prepuce, but *imperforate.* The orifice of the urethra was found at the base of the clitoris, there being an entire absence of the triangular smooth surface known as the *vestibule.* The urethra opened into a normally-developed bladder. The integument, situated in front of the pubes, and which in the female is known as the mons veneris, was more developed than is usual in the male, and was covered with an abundant crop of hair. The folds of integument on either side of the sulcus (labia majora) contained a normally-developed testicle, having the usual form,

size, and general conditions of the male testicle. Placed within the folds of integument containing the testicle and enclosing the upper third of the sulcus were two smaller folds, the homologues of the labia minora in the female.

This description also answers for the brother. Of the girl not so much is known. What is known is as follows: At birth a very large clitoris was observed, so large that at first she was supposed to be a boy. Although dressed in female attire, she was retained at home, and it was not until about puberty that her sex was positively ascertained. Those who associated intimately with her frequently remarked that she ought to be in male attire. The subjects of this sketch are of good average ability, the boys being engaged in business, and the girl attending to her family duties satisfactorily.

All are married, but without issue.

The doubt as to the sex in these cases, extending through infancy and childhood up to adult age, with slow development of the genitalia, makes it of interest to the biologist.

L. H. Luce, M.D.

The family in which these cases occurred consisted of six children. Three of them were indisputably females, as was subsequently verified by two of them bearing children, though the youngest was reported to be malformed, probably from the fact of her possessing an immense clitoris, and was masculine in appearance. The eldest girl married, but soon separated from her husband. I did not become professionally connected with the family until after the first children were born, and was present at the births of the two youngest only,—one a perfect male in every respect, the other also perfect, with the exception of the genitals, which were malformed. At first sight they were female organs, and the appearance was so perfect and deceptive that I did not give it a second thought until the nurse called my attention to it. Examination revealed the following make-up of the parts: Two apparently perfect labia were divided by a deep sulcus, covered by the common skin, which grew deeper as it ran under the pubic arch, and took on more of the characteristics of

mucous membrane, and ended in a cul de sac. At the root of a small penis, imperforate, the orifice of the urethra protruded. As I could not detect any testicles, and thought it might possibly be an imperforate vagina, I advised them to await developments before deciding the sex; but from the experience of the previous case it was concluded to consider it a male. Subsequently, after puberty, I made two examinations, and found two well-developed testicles situated in the lower part of the false labia. His sexuality was strong. He eventually married, but his wife obtained a divorce. The eldest, of whom I had no knowledge except by common report, was thought by his parents to be a female up to the time of puberty, and was given a feminine name, but was then changed to a masculine one, and male attire adopted. This case was presumably identical with the other. The parents were robust, healthy people, with no peculiar hereditary tendencies. The father was a powerful man, possessed of an uncommonly strong will, strength, and energy, but of violent and ungovernable passions. The mother was the opposite,—mild and amiable, and markedly feminine in appearance. She was often the victim of his ungovernable temper. A brother of his had eleven children, all females. The mother and the six children are yet living; the father is dead.

Wm. H. Luce, M.D.

MORPHOLOGY OF THE BLOOD CORPUSCLES.

BY CHARLES-SEDGWICK MINOT.

IF one goes through the very extensive literature dealing with blood corpuscles one finds the most divergent views defended, and can hardly reach clear ideas, for the conceptions do not agree among themselves, either as to their structure or as to the development of the corpuscles. According to some the red corpuscles arise from the white; according to others the white corpuscles arise from the red; and according to still others both kinds arise from indifferent cells. In regard to one point only is the majority of investigators united,—namely, in the silent assumption that all blood corpuscles are of one and the same kind in spite of the absence of the nucleus in mammalian corpuscles. It is just this assumption that has caused endless confusion, and the morphology of the blood corpuscles can be cleared up only by starting with the recognition of the fundamental difference between nucleated and non-nucleated corpuscles. Farther, it must be recognized that no corpuscles, neither red nor white, arise from nuclei.

The origin of red corpuscles from nuclei has been maintained several times. This notion is based upon defective observations. It is very easy in the chick, for example, to convince oneself that the first blood corpuscles are cells; in the area vasculosa, at the time of the blood formation, the red blood-cells are readily seen, in part lying singly, in part in groups (blood islands), adherent to the vascular walls; the free cells are constituted chiefly by the nucleus, which is *surrounded by a very thin layer of protoplasm*, which is very easily overlooked, especially if the preparation is not suitably stained; this explains, I think, the statement made by Balfour (Works, Vol. I.) and others, that the blood corpuscles consist only of nuclei. By following the development along further we find that the protoplasm enlarges for several days, and that during the same time there is a progressive diminution in size of the nucleus, which, however, is completed before the layer

of protoplasm reaches its ultimate size. The nucleus is at first granular, and its nucleolus, or nucleoli, stands out clearly; as the nucleolus shrinks it becomes round, and is colored darkly and almost uniformly by the usual nuclear stains. This species of blood corpuscle occurs in all vertebrates, and represents the *genuine blood-cells*. According to the above description we can distinguish three principal stages: 1, young cells with very little protoplasm; 2, old cells with much protoplasm and granular nucleus; 3, modified cells with shrunken nucleus, which colors darkly and more uniformly. I do not know whether the first form occurs in any living adult vertebrate, although the assumption seems justified that they are the primitive form. On the other hand, the second stage is obviously that characteristic of the Ichthyopsida in general, while the third form is typical for the Sauropsida. Therefore the development of the blood-cells in amniota offers a new confirmation of Louis Agassiz's law (Haeckel's Biogenetiches Grundgesetz).

The blood-cells of mammals pass through the same metamorphoses as those of birds; for example, in rabbit embryos the cells have reached the Ichthyopsidan stage on the eighth day; two days later the nucleus is already smaller, and by the thirteenth day has shrunk to its final dimensions.

The white blood corpuscles appear much later than the red cells, and their exact origin has still to be investigated, for it has not yet been determined where they first arise in the embryo; nevertheless we may venture to assert that they arise outside the vessels. The formations of leucocytes outside of the vessels is already known with certainty to occur in later stages, as well as in the adult. The sharp distinction between the sites of formation of the red and white cells appears with especial clearness in the medulla of bone in birds, as we know from the admirable investigations of J. Denys (La Cellule, Tome IV.). The white blood corpuscles, then, are cells, which are formed relatively late, and wander into the biood from outside.

The non-nucleated blood corpuscles of adult mammals are entirely new elements which are peculiar to the class, and arise neither from red nor yet from white blood-cells. Their actual

development was first discovered, so far as I know, by E. A. Schäfer, who has given a detailed account of the process in the ninth edition of Quain's Anatomy, and has shown there a full appreciation of the significance of his discovery. Unfortunately Schäfer's important investigations have received little attention. Kuborn has recently confirmed Schäfer's results in an article (*Anatom. Anzeiger*, 1890) on the formation of blood corpuscles in the liver. One can readily study the process in the mesentery and omentum of human and other embryos. The essential point of Schäfer's discovery is that the non-nucleate corpuscles have an *intra*-cellular origin, and arise by differentiation of the protoplasm of vasoformative cells. Several corpuscles arise in each cell without participation of the nucleus; they are, therefore, specialized masses of protoplasm, and may perhaps best be compared to the plastids of botanists. I venture to propose the name of blood-plastids for these structures, since the term corpuscle (globule, Körperchen) has no definite morphological meaning.

Sonsino (*Arch. Ital. Biol.* XI.) affirms that the red blood-cells transform themselves into plastids. I have, however, never been able to find the intermediate forms in my own numerous preparations. I deem it probable that he has seen merely the degenerating stages of the red cells.

The present article is an abstract of a communication made in August last to the American Association for the Advancement of Science. Since then Howells' memoir on the blood corpuscles has appeared (*Journal of Morphology*, IV., 57). The author describes the ejection of the nucleus from the red cells, and believes that this results in the formation of red plastids. The process is, I think, really degenerative, and the resemblance between the non-nucleated body of the cell and a true plastid is not one of identity. Certainly, until proof is offered that the observations of Schäfer, Kuborn, and myself upon the intra-cellular origin of the plastids are proved erroreous, the emigration of the nucleus of the red-cells cannot be held to result in producing plastids, but only to be degenerative. That the red cells degenerate and disappear has been known; Howells' valuable observations indicate the method of their destruction.

The above review shows that the vertebrate blood corpuscles are of three kinds: 1, red cells; 2, white cells; 3, plastids. The red and white cells occur in all (?) vertebrates; the plastids are confined to the mammals. The red cells present three chief modifications; whether the primitive form occurs in any living adult vertebrate I do not know; the second form is persistent in the Ichthyopsida, the third form in the Sauropsida. According to this we must distinguish:

A.—One-celled Blood, *i. e.*, first stage in all vertebrates; the blood contains only red cells with little protoplasm.

B.—Two-celled Blood, having red and white cells; the red cells have *either* a large, coarsely granular nucleus (Ichthyopsida), or a smaller, darkly staining nucleus (Sauropsida, mammalian embryos).

C.—Plastid Blood, without red cells, but with white cells and red plastids; occurs only in adult mammals.

Mammalian blood in its development passes through these stages, as well as through the two phases of stage B, all in their natural sequence; the ontogenetic order follows the phylogenetic.

I pass by the numerous authors whose views conflict with mine, partly because the present is not a suitable occasion for a detailed discussion, partly because those authors who have asserted the origin of one kind of blood corpuscle by metamorphosis from another have failed to find just the intermediate forms; it seems to me, therefore, that most at least of the opposing views collapse of themselves.

PROBABLE CAUSES OF POLYGAMY AMONG BIRDS.

BY SAMUEL N. RHOADS.

DURING a recent perusal of Darwin's "Descent of Man," I was impressed by the frequency of his citation of gallinaceous birds as best illustrating the theory of sexual selection in its relation to the development of secondary sexual characters among animals. Probably half the species cited in the four important chapters devoted to birds belong to the Gallinæ, and this may be taken as sufficient proof that the order deserves special study in our search for the causes of sexual variation, the history of descent, and the origin of special characters, which, we have reason to suppose, are the result of progressive development from ancestral beginnings.

Gallinaceous birds, as an order, are noteworthy,—nay, almost unique,—for their love antics, use of instrumental music to supply deficiency of vocal organs, manner of ornamentation in color and form, seasonal moult for special protection, combativeness, and the practice of polygamy.

It not being Darwin's object to treat of polygamy, save in its connection with development of secondary sexual characters, we find no attempt on his part to explain the causes of it; nor, so far as I am able to discover, has such attempt been made public by any one. Darwin, however, calls our attention to the fact that among all avian forms which practice polygamy there are none which do not present strongly-marked sexual differences.[1] This is significant, and leads to the supposition that the two characters, being inseparable, are also interdependent. I shall endeavor to prove that polygamy, from the nature of those causes which produced it, is necessarily associated with strongly-marked sexual differences, though these differences sometimes exist among monogamous species; in other language; that distinctive sexual characters are a necessary factor to the existence of polygamy in birds. A few exceptions to this rule, notably of the

[1] Descent of Man, Vol. I., pp. 257–262.

horse, which exhibits slight sexual disparity, are to be found among polygamous mammals, but so far as we know, none exist among aves. Seeing that such is the case, it is fair to infer that monogamous birds should present, if any, much less distinctive sexual differences. Generally speaking this is the rule, and it will be shown that the exceptions to it result from peculiar conditions of environment or of physical structure which nullified the tendency to polygamy.

The value of the following remarks must depend somewhat on the success with which Darwin has proved that sexual selection is the cause of specific distinctions among birds through successive variations, induced by the choice of the female during courtship. The conclusions arrived at in this paper are therefore supplementary to his, and are based on the supposition that although he may have attached too great importance to his theory of sexual, as distinguished from natural, selection, we must believe, nevertheless, that sexual selection exerts a powerful influence in the genesis of species.

Premising this, we may conclude: 1st, That the present status of development in birds practicing polygamy is the result of sexual selection. 2d, That the standard of female choice was, in the majority of cases, the relative perfection of beauty of coloration in the male and hence also of display by him, from which habit would arise the tendency to specialization of form, as instanced in the extraordinary development of alar and caudal appendages among many polygamous species. 3d, That in proportion to this tendency toward plumage specialization the male differs from the female in that he alone develops thus; therefore, 4th, In view of this, we must conclude that all polygamous species have originated from a less ornamented type which more closely resembled the female than her mate of to-day, while the difference between these was reduced to a minimum in the distant past; and that the young of both sexes remained constant to the garb of the adult female during the first year. 5th, That this specialization was not transmitted to the female and young, owing to their greater need of protection by obscure tints, and to the incon-

venience of those ornamental appendages during the period of reproduction.[2]

Added to these necessary results of sexual selection we should note the fact that, in proportion to the higher coloration or other masculine superiority of ornament over that of the female of the same species, all birds are more pugnacious and destructive to their rivals, and this tendency among those of polygamous habits finds further vent in their destruction of the eggs and newly-hatched young.

From what has been said we may reasonably assume that strongly-marked, sexually limited, secondary characters, and a combative, irritable disposition, being ever associated with the habit of polygamy, they therefore must be in some way interdependent, and the one naturally resultant from the other. Nor do the results of inquiry in this direction refute such assumption, however they may seem to fail to establish its verity or give a satisfactory solution of the problematic causes of polygamy as practiced by birds. Shall we consider, then, that the polygamous habit is a cause of the tendency to perfection of secondary sexual characters, or that it is a result of that tendency? I incline to the latter opinion.

As we descend in the scale of being the lower orders become more strictly monogamous, till finally, among the lowest, androgynous forms appear, multiplying *ad infinitum* among the least specialized; whereas, if we ascend from these it is noticeable how the disposition to polygamous unions is confined to the highest type of a genus or the higher genera of the sub-order.

The genesis of to-day is an epitome of the genesis of those myriad yesterdays we call the past. If this be true we have no alternative but in the belief that birds originally practiced monogamy only, that ancestral forms presented no sexual disparity in size, coloration, or ornamentation, and that, in the case of the Gallinæ, its representatives may have originated from an obscurely-tinted, plain-haunting, monogamous ancestor.

Given, then, such a starting point, we advance on the supposition that sexual selection by the female, according to the stand-

[2] For full discussion on these points see "Descent of Man," Chaps. XV. and XVI.

ard of beauty of form and color of the male (a criterion of first importance in female choice) inclines to variability in the secondary characters of her offspring. Take a hypothetical case: A monogamous female Gallus, actuated in times long past by sudden fancy (causation always obscure), gives preference to a male of her kind because of his individual superiority as a bird of extra fine feathers and bearing. Their young naturally inherit somewhat of the parental peculiarity, and in accord with a recognized law, styled that of "prepotency," among highly-colored birds, they are also strong, healthy, and have a sexual vigor above their compeers. Thus inaugurated, the selective faculty works its unconscious leaven during centuries of slow development until the male descendants of that first pair would become conscious of their superiority and of the value of their peculiar charms to the females. Courtship, as distinguished from mere off-hand pairing, would now assert itself as a necessary preliminary to more intimate relations, the result of which is seen at the present day in the love antics, war dances, and dress parades that characterize the amours of polygamous birds. Pride and vanity inevitably follow competitive display, however innocent its origin, and by a natural and easy progression comes the passionate appeal to arms, culminating in the periodic passage-at-arms in a chosen arena. No pyrotechnic result this, but effected by centuries of slow combustion from a spark of female fantasy!

"So far not impossible," say you; "but where is your polygamist?" I answer: "There he is, as far as description may identify or an introduction make him your acquaintance; henceforth he can be no other; thus born, thus bred, polygamy is an inevitable result." As surely as the Eastern despot, of kingly descent and inherited superiority in mental and physical prowess, taketh unto himself, by virtue thereof, a harem of wives, so will our modern Gallus aspire to polygamous concubinage when he finds himself on the "lek"[3] of a spring morning, with glad prospect of a tournament ere sunrise herald him the victor of many a tilt.

[3] The spot chosen by polygamous birds on which to display their charms and battle for the ownership of the females.

Resultant upon the first display of rivalry in a monogamous species, which by reason of sexual selection has developed strong sexual distinctions, would begin the destruction of many males, while the females would be exempted. Besides this the victorious males would drive away and disable many which would otherwise pair, and the females, as numerous as ever, would consort with the victor,—some by choice, the rest instinctively. He, having in the first instance undesignedly made himself lord, not of one but of many, would probably, in accordance with former habit, pair with one and disregard the rest, which latter, finding themselves widowed of a chance to mate elsewhere, would solicit his attentions, and in course of time receive them, because of their importunities rather than from his desire of self-gratification. Plural intercourse, thus persisted in, would be sure to become habitual, and the desire of gratification develop in like ratio.

In this connection the statistics collected by Darwin of the numeric proportion of the sexes in birds show that, especially among the Gallinaceæ, females are less numerous than males, the most polygamous of these showing the greatest discrepancy. The proportion of male to female chicks, in a careful census of 1000 bred during eight years, was as 94.7 to 100, an excess in favor of the females. But with respect to birds in a state of nature, Brehm, Gould, and others assert that the males are proportionately far more numerous, and an experiment with the eggs of wild pheasants resulted in the production of "four or five males to one female." The ruff (*Machetes pugnax*), sole polygamist among the Scolopacidæ [4] exhibits similar disproportion.

While it should be remembered that females, because of their shy, retiring disposition and different period of migration, are not so likely to be seen by an observer or captured by the fowler as the more conspicuous and daring males, it may not be doubted that the number of the former exceeds that of the latter in most instances. Nor can we deny that some connection is apparent between this numerical ratio of the sexes and the practice of polygamy.

[4] The Solitary Snipe (*Scolopax major*) is thought to be polygamous. See Lloyd's "Game Birds of Sweden," 1867, p. 221.

It has been observed that among animals a prepotent male is likely to generate more females than males, while in the offspring of an impotent male the reverse holds true. This, is it will be seen, tends to balance the sexual proportion among polygamists, for the overproduction of females by a generation of prepotent males would finally exhaust their sexual power by the demands of excessive intercourse; and, as a result of the impotency thus incurred, the number of young males would increase. Hence polygamous sexual intercourse, while tending to extinction of the species when carried too far, has within itself a remedy by the natural tendency to increase the percentage of males in the next generation. This compensatory law, whereby nature seeks, as it were, to cure the evil results of polygamous excesses by male overproduction, may explain the present state of affairs as cited by Darwin and quoted above. Evidently the reformatory process is going on at the present day among the species enumerated, because the males are yet overtasked by too great preponderance of females. We find strong proof of this in the very examples given, for in the case of the domestic fowl, whose connubial relations are wisely regulated by the careful breeder, a larger percentage of female chicks were produced, while the eggs of unrestricted wild pheasants brought forth four times as many males as females.

Furthermore, it is worthy of note that among highly-ornamented animals virility is excessive. Cock pheasants, restricted to a scant number of hens, are sure to abuse them on that account, and the canary (*Fringilla canaria*), a monogamist by nature is, by reason of domestication and consequent specialization transformed into a modified polygamist, and in case he be not provided with more than one mate, she is tormented by his excessive amours. Like the turkey cock, male canaries will frequently destroy both eggs and young, presumably to induce the female to renew the sexual relation. The case of the canary is very convincing proof that human interference in sexual selection, with a view to higher coloration or improvement in secondary characters, has actually created excessive sexual power and desire, by virtue of which the bird's monoga-

mous nature is so changed as to induce it to polygamy. We may infer, therefore, that sexual power and high sexual characters go hand in hand, and that in proportion to the advance toward organic perfection, virility increases. A canary, so domesticated, probably would not at first endeavor to mate with more than one female, if not induced to do so by the breeder; but in a cage where one male is associated with many females his flirtations are notorious, and like human polygamists he practices favoritism,—one is his mistress, the rest, according to his inconstancy, maids of dishonor. No less convincing is the case of the wild mallard (*Anas boschas*). If a male and several females be captured and restricted to the limits of a small pond, and receive proper care, the latter will all receive the voluntary attentions of the drake, though in a state of nature he contents himself with one.

Especially, if not exclusively, does this hold true with monogamists presenting strong sexual differences. On the contrary, we should observe that species of slight sexual dissimilarity (and therefore plainly colored), however subjected to long domestication, retain with tenacity their original monogamous habits. For example, the male guinea fowl (*Numida meleagris*), when forced to associate with more than a single female, chooses one and ignores the rest; and Dixon asserts, in his book of "Ornamental Poultry," that the eggs of one female alone will, in such a case, prove fertile. Domestication, therefore, in the abstract will avail nothing unless seconded by previous condition of high ornamentation and strong sexual differences, or unless directed to the production of these. In the breeding of guinea fowl high coloration was not an object; in the canary it was a most desirable production; in the mallard it already existed, and required but slight change of environment and food habits to induce its possessor to alter its marriage code.

Putting facts together, I am induced to believe: 1st, That sexual selection in favor of beauty of color and form of secondary characters, whether voluntary or the result of man's interference, is always accompanied by proportionate increase of sexual vigor. 2d, That such increase is a provision of nature to

meet the excessive demands of consequent polygamous practices. 3d, That such prepotency, being born, so to speak, of sexual selection, may be restrained by unfavorable climatic conditions or inherent specific peculiarities in its tendency to produce such practices, while among species that are free from these limitations polygamy finds willing victims. 4th, That domestication may conduce to polygamy in two ways,—first, by removing these limitations, as in the mallard; or second, by artificial development of special characters not found in a state of nature, as in the canary. 5th, That the domestication of a monogamous species of slight sexual differences, unless first directed to the higher development of secondary characters, will have no influence on the connubial relations, as instanced by the guinea fowl.

It may be asked, Why, then, are not many highly-colored species merging toward polygamy? I reply that probably many are. The Trochilidæ, according to Salvin, are in some cases polygamous, and so are the Paradiseidæ, if we may believe Lesson, though Wallace inclines to doubt the fact. More intimate acquaintance with these families during the breeding period will possibly reveal indubitable proof that they contain many examples of a habit which, as is shown, is developed only in connection with extraordinary sexual secondary characters.

As was mentioned in the third of the above conclusions, the tendency towards polygamous unions may be checked by many circumstances of a physical or mental nature, or it may be nullified by conditions of environment. Among many highly-plumaged groups we find less quarrelsome dispositions than is common with the majority. This may be caused by climatic or constitutional influences, which, however, did not prevent development of secondary characters by sexual selection, yet restrained in great degree the spirit of rivalry and consequent destruction of high-tempered males commonly attendant on such development. Again it appears that the quarrelsome disposition is powerless in other families to destroy much life, because of the ability of males to escape each other when defeated, which, coupled with the uniform distribution and individual independence of the sexes in species of arboreal habits, enables conqueror and con-

quered equally certain of a wife,—"a Jill for every Jack," so to speak.

Birds most noted for polygamy are least adapted for escape by flight, and because of their terrestrial habits are more intimately associated for self-preservation. They are more liable to the attack of enemies both terrestrial and aerial, less migratory or capable of migration, and hence suffer more from vicissitudes of weather. Their habit of family association, added to the pugnacity of the males and clannishness of the females, results fatally to the weaker males, while the majority of those that survive are ostracized (another form of death) because of their inability to find a mate outside the harem. It is apparent, therefore, that the Gallinæ, on account of their physique and ancestral predilections, were constitutionally more likely to develop polygamous habits as they rose in the scale of being than the higher insessorial groups. I am disposed to believe that careful scrutiny of the habits of the Trochilidæ and Paradiseidæ will reveal that the former does not contain any polygamous species, but that the latter as a family generally practice it.

I base such a prediction purely on analogical reasoning from what is presented in the preceding paragraph. The Trochilidæ are remarkably pugnacious, but for structural reasons are quite harmless combatants, however furious and spiteful their contests may appear.[5] Further, their powers of flight enable them to escape each other, to seek and find females over a vast expanse of country, and to escape destruction from enemies despite their high ornamentation. With the birds of paradise we are less acquainted, but from their habit of assembling in certain trees for parade during courtship it is to be inferred that similar results to those always incident to such assemblages among polygamous species are likely to occur. The activity and flight-power of birds of paradise, according to Wallace, is remarkable, enabling them to escape their natural enemies; but during the pairing season the magnificent plumes of the three-year-old males render their flight more laborious and the

[5] See, however, account of battle between three males in Abbott's "Upland and Meadow," pp. 144, 145.

birds more conspicuous and liable to destruction. From our general knowledge of female preferences we must believe these highly-plumaged males more desirable than the plainly-colored two-year-olds;[6] but the percentage of the former to the latter is so very low that it is highly probable many females in their extremity "took hold of one" (figuratively speaking), preferring dishonor to the reproach of pairing with a less handsome bird. In view of the maximum development of the Paradiseidæ in their secondary sexual characters, an opposite course of selection on the part of the female would result in the regression of development to former obscurely-tinted male types, provided the unadorned males of the second year transmit to their offspring less distinctive secondary sexual characters than males of the third year. Such variability in the degree of transmission, when limited by age, is worth special study.

The conspicuous adornment of male polygamous birds, as I have said, exposes them to the scrutiny of their enemies, whereas the females, retaining their original protective colors, are still preserved. Another cause of male destruction is due to their greater value as prey, being larger and better favored than the opposite sex. These facts, coupled with their great destruction of each other, overbalance everything conducive to an increase of male birds and favor the preponderance of females, so that although a larger percentage of males be yearly produced, the law of survival, exclusively directed against them, perpetuates the inequality. Such, we exclaim, are the sad results of what may be termed psycho-physical development! Let not mankind sit in judgment here. The skirts of immortals are yet defiled by similar practices.

Before quitting this interesting subject we may discuss a few questions arising from the nature of our deductions.

Firstly,—among our native birds it is asserted that, after the turkey (*Melagris gallopavo*), the cock of the plains (*Centrocercus urophasianus*) and the pinnate grouse (*Cupidonia cupido*) practice polygamy to the greatest extent. It will be objected that the two

[6] See Wallace in *Annals and Mag. Nat. Hist.*, Vol. XX., on age of attainment of full male plumage in *Paridisea apoda*.

latter exhibit slight sexual dissimilarity, that their colors are obscure, and therefore the theory that distinctive secondary characters and strongly-marked sexual differences are necessary adjuncts to polygamous habit is disproved. This conclusion appears reasonable; but if we examine the sexes of both species during courtship the contrast between their respective males and females is very great, and the exhibition of secondary characters evident. In both the males possess large cervical appendages, which, during the reproductive period, assume a dark orange hue and are capable of voluntary inflation. In Centrocercus this distension is enormous, and observers who have witnessed the males at their leks assert that their natural appearance is thereby changed beyond recognition. In Cupidonia this inflation is further supplemented by overlying wing-like tufts, which, in connection with the crown and tail feathers, are erected on occasions of parade. Any one who will take the trouble and patience to observe these birds during the pairing season will not fail to wonder at the transformation of the cocks, and freely admit the possession by them alone of strongly characteristic sexual features. Worthy of remark, on the other hand, is the lack of these sexual differences in other nearly allied plain-haunting species, as exhibited by the monogamous red grouse and ptarmigan (*Tetrao scoticus* and *Lagopus albus*).

In the case of plain-loving species the results of sexual selection have been counteracted by the law of survival. So soon as any males became, in consequence of sexual selection, more conspicuous than the rest, they would be the most likely victims to beasts of prey by virtue of that superiority, while the less attractive would survive; and so the tendency toward high ornamentation would be thwarted as long as the species continued to exist under unaltered conditions of environment. The necessity of protective resemblance to many birds has thus exerted a controlling influence on sexual selection, and indirectly on polygamy itself.

The ability of organism to evade (so to speak) the laws of nature, or rather to compromise with conflicting laws, is curiously exhibited in the pinnate grouse. In it the selective tendency, in

accordance with the law which guided it toward specialization of color, finding its action at the outset nullified by the law of protective resemblance, made truce therewith, developing characters conformatory to both, first by modification of the form of plumes and addition of appendages of periodic color-brilliancy, and secondly by enabling the possessor of these characters to exhibit them at discretion, for in times of danger the wing-like neck tufts, previously employed to attract attention, in turn conceal the shrunken air-sacs from observation when depressed. Similar cases have produced other combinations of protective resemblance with high coloration, those parts of the body being most ornate which are screened from observation of other birds of prey, yet capable of voluntary display to an appreciative admirer, as many have witnessed in the sudden transformation of a passive, inconspicuous gobbler or peacock by mere erection and distension of certain parts.

If we premise that the original gallinaceous type from which the existing forms have sprung was an inhabitant of treeless plains of vast extent, the causes which have induced some to betake themselves to forests, while others clung to their original habitat, are difficult to surmise. Owing to well-recognized natural agencies, forest limits may have widely extended and at last invaded their haunts; or we may conjecture that migration, induced by climatic changes, was the cause of their first woodland experience. In either event the proximity of forests would result in the discovery by the birds of their value as a resort in times of danger, or for roosting purposes, or in the search of mast, when from any cause there was a scarcity of food stuffs in their accustomed feeding grounds. This would eventually remove the counter effects of the law of protective resemblance to sexual selection, and favor higher ornamentation, and thus, by slow degrees, the evolution of organic characters would progress simultaneously with a change of habits to accord with altered environment. The fact of the more gorgeously ornamented polygamists being forest-hunting species (witness the Menuridæ and Phasianidæ) is in full accord with our supposition. We may, on the other hand, attribute the continuance of Cupidonia and Cutrocercus in their orgi-

inal haunts to some physical peculiarity which became so strongly developed previous to any change in their secondary sexual characters as to necessitate a life on the barrens and prairie, and debar them from a woodland existence. *Centrocercus urophasianus* subsists wholly upon the buds of the Artemisia, which grows exclusively upon unwooded barrens and tablelands, and its gizzard has in consequence been so metamorphosed as to unfit it for the digestion of other food. Conditions none the less local and arbitrary may be discovered to restrict *Cupidonia cupido* to a prairie life, despite the evident tendency of natural law to induce him to quit it for the forest.

In an investigation of this nature, the infinite complexity of organic life, the inscrutable interdependence of natural laws, and the mysterious sequence of past events rise before us in fuller revelation. Nature stands accused of a mysterious crime. There is no direct evidence in the case. History and precedent seem to fail us, but the present—never. It is the supreme court; its records are perpetual, its proofs infallible, and its judgment based on the testimony of ages. Our appeal is made, and we must wait, trusting that the future will justify what the past allowed.

RECORD OF AMERICAN ZOOLOGY.

BY J. S. KINGSLEY.

(Continued from Vol. XXIV., page 816.)

IT is the intention to catalogue here in systematic order all papers relating to the Zoology of North America, including the West Indies, beginning with the year 1889. An asterisk indicates that the paper has not been seen by the recorder. Owing to the method of preparation it is impossible to collect in one issue all the papers relating to any group, but it is hoped that succeeding numbers will correct this. Authors are requested to send copies of their papers to J. S. Kingsley, Lincoln, Nebraska.

ARTHROPODA.

WATASE, S.—On the morphology of the compound eyes of Arthropods. Studies Biol. Lab. Johns Hopkins University, IV., p. 287, 1890.—See AM. NAT., XXIV., p. 373, 1890.

CRUSTACEA.

FEWKES, J. W.—A new parasite of Amphiura. Proc. Bost. Socy., XXIV., p. 31.—A copepod in brood sac.

HAY, O. P.—Notice of a supposed new species of Branchipus from Indiana. Proc. A. A. A. S., XXXVIII., p. 286.—*B. gelidus.*

ARACHNIDA.

MCCOOK, H. C.—Note on the true systematic position of the Ray Spider. Proc. Phila. Acad., 1889, p. 180.—Microepira Emerton = Theridiidsoma Cambridge. Notes on spinning habits.

WEED, C. M.—A descriptive catalogue of the Phalangiinæ of Illinois. Bull. Ill. State Lab. Nat. Hist., III., p. 79, 1889.—Describes ten species, of which *L. elegans*, *L. politus*, are new.

——A partial bibliography of the Phalangiinæ of North America, *l. c.*, p. 99, 1889.

"RILEY AND HOWARD."—A contribution to the literature of fatal spider bites. *Insect Life*, I., p. 204, 1889.—Case of poisoning from a bite of *Latrodectus mactans*.

WEBSTER, F. M.—Notes on a species of Bryobia infesting dwellings [in Indiana]. *Insect Life*, I., 277, 1889.

CORSON, E. R.—The spider bite question again. *Insect Life*, I., 280, 1889.—Six cases; none fatal.

BLANCHARD, A. D.—More evidence bearing on spider bites. *Insect Life*, I., 313, 1889.—One case.

RILEY, C. V.—The six-spotted mite of the orange. *Insect Life*, II., 225, 1890.—*Tetranychus 6-maculatus*, n. sp. from Florida.

COCKERELL, T. D. A.—*Phalangodes robusta. Can. Ent.*, XXI., p. 140, 1889.—Occurs in Colorado under logs.

Poison from spider bites. Discussion in Proc. Ent. Socy. Washington, I., p. 139, 1889.

MARX, G.—On a new and interesting spider from the United States. Proc. Ent. Socy. Washington, I., p. 166, 1889.—*Hypochilus thorelii* from Lookout Mountain, Tenn. (*vide Ent. Amer.*, IV., 160, 1888).

——On the importance of the structural characters of Hypochilus in the classification of spiders. Proc. Entom. Socy. Washington, I., p. 178, 1889.—A tetrapneumonous spider with dipneumonous features.

——On a new species of spider of the genus Dinophis from the Southern United States. Proc. A. N. S. Phila., 1889, p. 341, 1890.—*D. spinosus* (Alabama).

MCCOOK, H. C.—American spiders and their spinning work. A natural history of the orbweaving spiders of the United States, with special regard to their industry and habits. Philadelphia, 1889, Vol. I., 4°, pp. 372.—A general account, largely of habits. Will need to be read in structural portions in connection with Apstein.

KINGSLEY, J. S.—The ontogeny of Limulus. AM. NAT., XXIV., p. 678, 1890.

WEED, C. M.—A new Phalangium. AM. NAT., XXIV., p. 783, 1890.

POTEAT, W. L.—A tube-building spider. Jour. Elisha Mitchell Sci. Socy., 1889.—Description of the tubes constructed by

Atypus niger, and account of the methods of capturing food and feeding.

WEED, C. M.—The black harvest spider. AM. NAT., XXIV., p. 683, 1890.

HEXAPODA.

HOWARD, L. O.—A commencement of a study of the parasites of cosmopolitan insects. Proc. Entom. Socy. Washington, I., p. 118, 1889.—Gives list of arthropods, with European and American parasites.

SWARTZ, E. A.—[Insect fauna of Florida.] Proc. Ent. Socy. Washington, I., p. 145, 1889.—Abstract showing relationships of semi-tropical Floridan hexapods.

WEED, C. M.—Studies in pond life. Bull. Ohio Exp. Sta., Tech. Series, I., p. 4, 1889.—Life-histories, habits, etc., of various hexapods.

WEED, C. M.—A partial bibliography of insects affecting clover, *l. c.*, p. 19, 1889.—List of 82 species, with references.

COCKERELL, T. D. A.—Some notes on Dr. A. R. Wallace's Darwinism. *Nature*, XI., 393, 1890.

OESTLUND, O. W.—On the reproduction of lost or mutilated limbs of insects. Bull. Minn. Acad. Sci., III., p. 143, 1889.—Absence of reproduction in hexapods; figures five-winged *Tremex*.

FORBES, S. A.—Sixteenth report of the State entomologist on the noxious and beneficial insects of the State of Illinois. Springfield, 1890.—Deals with chinch bugs, cornbill bugs (Rhynchophora), cut worms (Noctuidæ), meadow maggot (*Tipula bicornis*), burrowing web-worm (*Pseudanaphora arcanella*), and gives (p. 122) a bibliography of chinch bug.

COCKERELL, T. D. A.—Some insects common to Europe and Colorado. *Ent. Mo. Mag.*, XXV., 255, 1889.

——Entomological notes from Colorado. Ibid, p. 324, 1889.—Continuation of above, etc.

——Notes from Colorado. Ibid, p. 362, 1889.

——Asymmetry in insects. Ibid, 382, 1889.

——Evolution of metallic colors in insects. *Entom. News*, I., p. 3, 1890.—Absence of knowledge of causes of color.

ORTHOPTERA.

WHEELER, W. M.—The embryology of *Blatta germanica* and *Doryphora decemlineata*. *Jour. Morphol.*, III., p. 291, 1889.

BRUNER, L.—New North American Acrididæ found north of the Mexican boundary. Proc. U. S. Nat. Mus., XII., p. 47, 1889 [1890].—The forms described are *Mesops cylindricus* (Neb.), *Dracotettex* [n. g.] *monstrosus* (Cal.), *Ochrilidia* (?) *crenulata* (Neb. to N. Mex.), *O.* (?) *cinerea* (Neb. to Idaho), *Mermira texana* (Tex., Mex.), *M. maculipennis* (Tex.), *Syrbula acuticornis* (Tex.), *Eritettix* [n.g.]*variabilis* (New Mex.), *Boötettix* [n. g.] *argentatus* (Tex., Mex.), *Pedioscertetes pulchella* (Idaho), *Psolœssa buddiana* (Tex.), *P. eurotiæ* (Col.), *Arphia saussureana* (Cal.), *Aulocara scudderi* (Kan. to Saskatchawan), *Mestobregma pulchella* (Mont.), *Conozoa texana* (Tex.), *C. albolineata* (Cal.), *C. kœbeli* (Cal.), *Trimerotropis cyaneipennis* (Utah), *T. azurescens* (Mont., Ida., Wy.), *T. bifasciata* (Cal.), *T. californica* (Cal.), *T. modesta* (N. Mex.), *T. thalassica* (Cal.), *T. pacifica* (Cal.), *T. perplexa* (Neb.), *Circotettix lapidicolus* (Idaho), *C. shastanus* (Cal.), *Œdipoda* (?) *occidentalis* (Cal.), *Thrincus* (?) *avidus* (N. Mex.), *Th.* (?) *maculatus* (Cal.), *Haldemanella robusta* (Ariz.). A plate illustrates the paper.

COLEOPTERA.

SHERMAN, J. D., JR.—Notes on Coleoptera of Peekskill, N. Y., for 1887. Proc. Ent. Socy. Washington, I., p. 162, 1889.—Habits and food plants.

SCHWARTZ, E. A.—Notes on the food habits of some North American Scolytidæ and their Coleopterous enemies. Proc. Ent. Socy. Washington, I., p. 163, 1889.

——On a collection of Coleoptera from St. Augustine, Fla. Proc. Ent. Socy. Washington, I., p. 169, 1889.—Facies of fauna.

——Coleopterological notes. Proc. Ent. Socy. Washington, I., p. 174, 1889.—*Spæricus gibbus*, a museum pest; Scolytidæ on tamarack; sexes in Pissodes and Photinus; notes on Sinoxylon.

TOWNSEND, TYLER.—Twelve species of Coleoptera taken from stomachs of toads in Michigan, with remarks on the food habits of toads. Proc. Ent. Socy. Washington, I., p. 167, 1889.

WEED, C. M.—Preparatory stages of the 20-spotted lady bird. Bull. Ohio Exp. Sta., Tech. Series, I., p. 3, 1889.

——Studies in pond life, *l. c.*, p. 4, 1889.—Life-histories and habits of *Listronotus latiusculus*, *Donacia subtilis*, *Hippodamia 13-punctata.*

WHEELER, W. M.—The embryology of *Blatta germanica* and *Doryphora decemlineata. Jour. Morphol.*, III., 291, 1889.

FORBES, S. A.—Cornbill bugs [Rhynchophora] in 16th Rep. Entom. Ill., p. 58, 1890.—*Sphenophorus minimus*, n. sp.; figures of *S. ochreus*, *pertinax*, *robustus*, *scoparius*, *melanocephalus*, *placidus*, *parvulus.*

BLANCHARD, F.—Revision of the species of Cardiophorus Esch. of America north of Mexico. Trans. Am. Ent. Socy., XVI., p. 1, 1889.—Enumerates 31 species, the following new: *C. bifasciatus* (Cal.), *coxalis* (Oreg.), *pullus* (Colo.), *gemmifer* (Nev., Cal.), *abbreviatus* (Cal.), *angustatus* (Fla.), *nevadensis* (Nev.), *crinitus* (Cal.), *pubescens* (Wy., N. Mex., Colo.), *carbonatus* (Cal.), *seniculus* (Cal.), *dispar* (Cal.).

DIETZ, W. G.—On the species of Macrops Kirby inhabiting North America. Trans. Am. Ent. Socy., XVI., p. 28.—33 species, the following new: *M. indistinctus* (N. J. to Wy.), *cryptops* (Ga., Fla.), *hyperodes* (Cal.), *nevadensis* (Nev.), *gryphiodes* (Wy. to Tex.), *wickhami* (N. Mex.), *interpunctulatus* (Neb. to Tex.), *ulkei* (Dak., Wy., Tex.), *dorsalis* (Ill., La., Tex.), *tenebrosus* (Mont., Dak., Wy.), *alternatus* (Ill.), *montanus* (Ill. to Mont.), *interstitialis* (Or.), *hornii* (Ga., Fla.), *setiger* (Fla.), *subscribratus* (Fla.), *longulus* (Dak.), *rotundicollis* (Tex.), *obscurellus* (Tex., D. C.), *imbellis* (La., Wash. Terr.), *hirtellus* (Ariz., N. Mex.), *echinatus* (Mass. to Ariz.), *obstectus* (Ariz.), *myasellus* (Colo.), *mirabilis* (Ill.), *californicus* (Cal., Wash.), *anthracinus* (Fla.).

HAMILTON, JOHN.—Catalogue of the Coleoptera common to North America, Northern Asia, and Europe, with the distribution and bibliography. Trans. Am. Ent. Socy., XVI., p. 89, 1889. —484 species enumerated, 481 being common to Europe and America, 328 occurring in Asia. Notes are given on several species doubtfully referred to the North American fauna.

HORN, G. H.—Antennæ of Coleoptera. Proc. A. N. S. Phila., 1889, p. 311, 1890.—Seat of special sense.

COCKERELL, F. D. A.—Colorado Coleoptera. *Ent. Mo. Mag.*, XXV., p. 186, 1889.—List of finds.

LEWIS, G.—On a new species of Teretriosoma. *Ent. Mo. Mag.*, XXV., 397, 1889.—*T. horni* (Key West).

HORN, G. H.—Notes on Coleoptera. *Entom. News*, I., p. 9, 1890.—Separation of species of Cryptohypnus.

LIEBECK, CH.—*Phytonomus punctatus* Fabr. *Ent. Notes*, I., p. 12, 1890.—Abundant at Philadelphia (?)

HAMILTON, J.—Rare beetles on the New Jersey coast. *Ent. Notes*, I. p. 12, 1890.—*Cafius sericeus, Cryptobium pusillum, C. lugubra, Quedius brunneus, Actobius nanus.*

WICKHAM, H. F.—Notes from the northwest. *Ent. Notes*, I., p. 33, 1890.—Captures in Montana to Oregon and Victoria.

LUGGER, OTTO.—Fond of grammar. *Ent. Notes*, I., 38, 1890. —Larva of *Trogosita mauritanica* boring in books.

LIEBECK, C.—Notes on Coleoptera. *Ent. Notes*, I., 52, 1890.

HORN, G. H.—Notes on Elateridæ. *Ent. Notes*, I., 53, 1890. —Notes on Candeze's species, chiefly synonymical; *Megapenthes limbalis* is male, *M. granulosus* female; *Corymbites inflatus* male, *C. crassus* female.

HAMILTON, JOHN.—Balaninus: its food habits. *Can. Ent.*, XXII., p. 1, 1890.—Habits of *B. proboscideus, rectus, quercus, nasicus, caryæ, uniformis, obtusus.*

COCKERELL, T. D. A.—Notes on the insect fauna of high altitudes in Custer county, Colorado. *Can. Ent.*, XXII., p. 37, 1890.

COOK, A. J.—A new clothes beetle. *Can. Ent.*, XXI., p. 187, 1889.—*Lasioderma serricorne.*

*BOURGEOIS, J.—Deux malacodermes noveaux de l'Amérique meridional. Ann. Soc. Ent. France, VIII., 4 Trim. Bull., 176, 1889.—*Chauliognathus cardiaspis, Cantharis metallica.*

*BLANCHARD, F.—Observations on some variations of the males in Clinidium. *Psyche*, V., p. 165, 1889.

*WOODWORTH, C. W.—Trox at electric light. *Psyche*, V., p. 169.

SCHWARTZ, E. A.—On *Xyleborus pyri* and an undescribed allied species. Proc. Ent. Socy. Washington, I., p. 138, 1889.—Describes mines of *X. pyri* and of new (unnamed) species from Florida.

——On the types of *Tomicus limnaris* Harris. Proc. Ent. Socy. Washington, I., p. 149, 1889.—Shows that Harris confused *Hylesinus opaculus* with above. Gives Harris's notes on other Scolytidæ.

——Termitophilous Coleoptera found in North America. Proc. Ent. Socy. Washington, I., p. 160, 1889.—Enumerates nine species.

HORN, G. H.—A synopsis of the Halticina of boreal America, Trans. Am. Ent. Socy., XVI., 163, 1889.—An extensive (158 pages) paper, with numerous new species and the following new genera: Pseudolampsis, Phydanis, Hemiphrynus, Hemiglyptus, Leptotrix.

LONG, C. W.—Staten Island fireflies. AM. NAT., XXIV., p. 691, 1890.

HEMIPTERA.

HEIDEMANN, O.—Remarks on the Hemiptera collected by Mr. Schwartz in Dade county, Florida. Proc. Ent. Socy. Washington I., p. 142, 1889.—General account.

UHLER, P. R.—Observations on the Heteroptera collected in Southern Florida by Mr. E. A. Schwartz. Proc. Ent. Socy. Washington, I., p. 142, 1889.—95 species collected, the following new: *Acanthochila exquisita.*

WEED, C. M.—Studies in pond life. Bull. Ohio Exp. Sta., Tech. Series, I., p. 4, 1889.—Habits of *Zaitha fluminea, Notonecta indulata;* eggs of *Benacus grisea, Belostoma americanum.*

FORBES, S. A.—Studies on the chinch bug, II., 16th Rep. Entom. Ill., p. 1, 1890.

——Contribution to an economic bibliography of the chinch bug. 16th Rep. Entom. Ill., Appendix, 1890.

DISTANT, W. L.—Description of a new species of neotropical Capsidæ. *Ent. Mo. Mag.*, XXV., p. 202, 1889.—*Eccritotarsus exitiosus* (Trinidad).

COCKERELL, T. D. A.—*Coccus cacti* in Colorado. *Ent. Mo. Mag.*, XXV., 382, 1889.

WEED, C. M.—Siphonophora or Nectarophora. *Ent. Notes*, I., p. 20, 1890.—Former preoccupied.

GILLETTE, C. P.—*Abcanthia papistrilla* in nests of the barn swallow. *Ent. Notes*, I., 26, 1890.

*Uhler, P. R.—New genera and species of American Homoptera. Trans. Amer. Acad. Science for 1888–89, p. 33, 1889. —Mostly California forms.

DIPTERA.

Forbes, S. A.—The meadow maggots or leather jackets. 16th Rep. Entom. Ill., p. 78, 1890.—Larva of *Tipula bicornis.*

Ives, J. E.—An interesting method of egg deposition. *Ent. Notes,* I., p. 39, 1890.—Oviposition of Atherix.

LEPIDOPTERA.

Aaron, E. M.—*Erebia epipsodea* var. *sine-ocellata. Ent. Notes,* I., p. 12, 1890.—Synonym of *E. epipsodea* var. *brucei.*

Slosson, A. T.—May moths in northern New Hampshire. *Ent. Notes,* I., p. 17, 1890.

Skinner, H.—Random notes on Lepidoptera. *Ent. Notes,* I., p. 19, 1890.—Sex of Cecropia cocoons, male compact, lighter in color, and more slender; cocoons of Callosamia.

Jones, F. M.—Notes on *Smerinthus astylus* Drury. *Ent. Notes,* I., 21, 1890.—Life-history.

Aaron, E. M.—North American Hesperidæ. *Ent. Notes,* I., 23, 1890.—First of series; descriptions of *Eurycides urania* West., and *Eudamus hesus* West., Southwest U. S.

Skinner, H.—Notes on Lepidoptera. *Ent. Notes,* I., p. 51, 1890.—*Protoparci dalica* = *P. rustica; Phyciodes ianthe* = *Acca hera; Eresia taxana* = *Smerdis.* Questions distinctions of *Œnosanda noctuiformis* and *Cantethia grotei;* asks for type of *Arctia pallida.*

Beutenmüller, W., and Skinner, H.—[Spinning of *Callosamia angulifera.*] *Ent. Notes,* I., 58, 1890.

Skinner, H.—Two new species of butterflies. Trans. Am. Ent. Socy., XVI., 86, 1889.—*Anartia dominica* (West Ind.), *Myscelia streckeri* (Lower Cuba).

Riley, C. V.—Two brilliant and interesting Microlepidoptera, new to our fauna. Proc. Ent. Socy. Washington, I., p. 155, 1889.—Describes as new *Setiostoma fernaldilla* (Los Angeles, Cal.) and *Walsinghamia* [n. g.] *diva* (Florida).

Weed, C. M.—Studies in pond life. Bull. Ohio Exp. Sta., Tech. Series, I., p. 5, 1889.—Habits and life-history of *Arzama obliquata.*

FORBES, S. A.—Notes on cut worms. 16th Rep. Entom. Ill., p. 84, 1890.—Noctuids, several larvæ figured.

——The burrowing web worm. 16th Rep. Entom. Ill., p. 98, —*Pseudanaphora acanella.*

BARRETT, C. G.—Capture of *Hadena albifusa* Grote in Great Britain. *Ent. Mo. Mag.*, XXV., 180, 1889.

COCKERELL, T. D. A.—*Alucita hexadactyla* L. in Colorado. *Ent. Mo. Mag.*, XXV., 212, 1889.

SMITH, J. B.—*Hadena albifusa* Grote in Great Britain. *Ent. Mo. Mag.*, XXV., 228, 1889.

SKINNER, H.—Notes on butterflies found at Cape May, N. J., with description of a new species of Pamphila. *Entom. News*, I., p. 6. 1890.—*P. aaroni*, range of *Satyrus alope*, oviposition of *Terias lisa*, first stages of *Pamphila panoquin.*

SMITH, J. B.—Preliminary catalogue of the Arctiidæ of temperate North America, with notes. *Can. Ent.*, XXII., p. 9, 31, 1890.—Genera *Arctia.*

GROTE, A. R.—Note on the larval ornamentation of the N. Am. Sphingidæ. *Can. Ent.*, XXII., p. 15, 1890.

BEUTENMÜLLER, WM.—Descriptions of Lepidopterous larvæ. *Can. Ent.*, XXII., p. 16, 1890.—*Mamestra lorea, Phycis rubifasciella, Salebria contatella, S. celtella, Botys fissalis.*

GROTE, A. R.—Note on the genus Crocota and Prof. J. B. Smith. *Can. Ent.*, XXII., p. 17, 1890.—Controversial.

EDWARDS, W. H.—Description of a new species of Melituca from Southern California. *Can. Ent.*, XXII., p. 21, 1890.—*M. augusta.*

GROTE, A. R.—The Noctuidæ of Europe and North America compared [continued]. *Can. Ent.*, XXII., p. 26, 1890.

COCKERELL, T. D. A.—*Erebia epipsodea* var. *sine-ocellata. Can. Ent.* XXII., p. 40, 1890—(?) var. *brucei.*

BEUTENMÜLLER, WM.—Description of the larva of *Trirhabda tormentosa. Can. Ent.*, XXII., p. 36, 1890.

RILEY, C. V.—Notes on Pronuba and Yucca pollination. Proc. Ent. Socy. Washington, I., p. 150, 1889.—Largely controversial.

BLAKE, C. A.—Hop-worms. *Ent. Notes*, I., p. 43, 1890.—Larva of *Gortyna nitela.*

EDWARDS, H.—Bibliographical catalogue of the described transformations of North American Lepidoptera. Bulletin U. S. Nat. Mus. No. 35, pp. 147, 1889.—References to early stages of 1069 species.

SMITH, J. B.—Contributions toward a monograph of the Noctuidæ of temperate North America.—Revision of some Tæniocampid genera. Proc. U. S. Nat. Mus., XII., p. 455, 1889 [1890].—The genera included are Barathra, Trichoclea, Scotogramma, Ulolonche, Himella, Crocigrapha, Orthodes, Tæniocampa, Perigrapha; no new species.

TAYLOR, W. E.—Preliminary catalogue of and notes on Nebraska butterflies. AM. NAT., XXIII., p. 1024, 1889 [1890].

HYMENOPTERA.

HARRINGTON, W. H.—Tenthredinidæ collected at Ottawa [Canada], 1889. *Can. Ent.*, XXII., p. 23, 1890.

COCKERELL, T. D. A.—Notes on the insect fauna of high altitudes in Custer county, Colorado. *Can. Ent.*, XXII., p. 37, 1890.

HARRINGTON, W. H.—The corn saw fly. *Can. Ent.*, XXII., p. 40, 1890.—*Cephus pygmæus* at Ottawa and Buffalo.

*GILLETTE, C. P.—Notes on certain Cynipidæ, with descriptions of new species. *Psyche*, V., 183, 1889.

ROBERTSON, C.—Notes on Bombus. *Ent. Notes*, I., p. 39, 1890.—Distinctness of *B. americanorum* and *B. pennsylvanicus*; *Apathus elatus* male of first.

HAMILTON, J.—The inhabitants of a hickory nut gall. *Ent. Notes*, I., 49, 1890.—*Pimpla, Phanerotoma tibialis.*

CRESSON, E. T.—[In above, p. 50].—Describes as new *Pimpla grapholithæ* from Missouri.

ROBERTSON, CH.—Synopsis of North American species of the genus Oxybelus. Trans. Am. Ent. Socy., XVI., p. 77, 1889.—14 species; new are *O. subulatus* = *mucronatus* Pack. (Penn. to Mont.), *cornutus* (Mont.), *packardii* = *lactus* Pack. (Ill., Tex.), *sericus* (Ill.), *fulvipes* (Fla.), *niger* (Ill.), *cressonii* (Ill.), *mexicanus* (Mex.), *frontalis* (Pa., Ill., Tex.), *forbesii* (Colo.).

ASHMEAD, W. H.—Descriptions of new Ichneumonidæ in the collection of the U. S. National Museum. Proc. U. S. Nat. Mus.,

XII., p. 387, 1890.—No new genera are characterized. Keys are given of the species of Eristicus, Hemiteles, Cryptus, Orthopelma, Limneria. Many new species are described.

EDITORIAL.

EDITORS, E. D. COPE AND J. S. KINGSLEY.

ABOUT fifty years ago the British Association for the Advancement of Science adopted certain rules for the guidance of nomenclators in science. These rules were based partly on customs which had become prevalent, but all were designed to secure fixity in consonance with the other interests of science. These other interests of science may be embraced under two heads: First, the maintenance of a high standard of scientific work; second, justice to the investigator. In accordance with these views, fixity is secured by the strict adhesion to the law of priority, without exception. The standard of scientific work is sustained by the requirement that names adopted shall represent work done or ideas worked out, and not prospective discoveries to be made or not made at some future time. Justice to the investigator is secured by the two requirements just mentioned, viz., that the originator of ideas and the discoverer of facts, and not some other person, shall be credited with them.

These rules have been carried more and more fully into practice as time has advanced. The American Association in 1876 adopted similar rules, and the Congress of Zoologists of Paris has followed the same example. The attempts made by scientists holding important positions in the governmental or other educational organizations to ignore and override the work of private and perhaps humbler citizens, which were not uncommon in the early part of this century, have fallen to the ground. In fact, we are now confronted with the opposite extreme, viz., the dis-

position to recognize pretenders to scientific research who do not fulfil the requirements of the second of the ends above mentioned, which a healthy nomenclature has in view. It is in this democratic country that this danger has arisen, in the adoption by some naturalists of the opinion that names are to be adopted which represent nothing, and which should therefore never be regarded as a part of scientific literature. The result to science is quite the same as that produced by the autocratic practices of official scientists of a half century ago, viz., the encouragement of pretence and the discouragement of work. The only difference is that all kinds of shams are recognized, and not only official shams. We have here an illustration of the close affinity between mobocracy and aristocracy. Indeed, they may harmonize perfectly under the system referred to. We are reminded of the song in Madame Angot's Daughter:

Jadis les rois une race proscrite
Enrichissait leurs partisans
Ils avaient mainte favorites
Et cent mille courtezans.

* * * *

Mais Barras est roi et Lange est sa reine,
Il n'ait pas la peine, il n'ait pas la paine,
Il n'ait pas la paine assurement
Changer le gouvernement!

It was indeed scarcely worth while to adopt rules if we were to be transferred from official monopolists to lexicographers and catalogues of gardeners and dealers in butterflies, bird-skins, and shells!

The rules for the correct construction of scientific names are based on ordinary classical orthography, which needs only to be known to be followed. Yet this is often ignored, not only in America but in Europe, in the most glaring manner. Thus, hybrid names have been repeatedly constructed, such as Venustodus and latirhinus, and they cannot be set aside if put forth as the expression of good scientific work. Classical accomplishment is not of course science, but it is a pity to have scientific literature defaced by such exhibitions of ignorance. The fact that such

names can only be changed, if at all, by their authors, should make nomenclators careful. Attention to euphony is recommended in the rules. Names should be pronounceable or usable, otherwise they are liable to be set aside in familiar converse if not in the systems. Thus we have Homalodontotherium, of unnecessary length; Propalaehoplophorus, which is almost unpronounceable; Neeuryurus and Hipphaplous, still worse. And all this where endless opportunities for the construction of names, both short and euphonious, exist.

A reform is needed in some quarters in the matter of complimentary names. The object of naming a species or genus after a person is to compliment that person, and in order that it shall do so some care in the use of the method should be observed. The undiscriminating use of it of course destroys it as a compliment. But it is an easy way of escaping the necessity of constructing a suitable classical name on the part of persons who never studied Latin. One abuse of the custom we refer to specifically, and that is the habit, seemingly very common, of naming species after deceased persons. Such persons do not appreciate the compliment.

—The peculiarities of an admixture of science and politics are exemplified in the case of Indiana. The last Legislature made the office of State Geologist an elective one, and this year all four parties nominated candidates for the office. The result is not one to commend itself to the scientific mind. The Republicans nominated a good *botanist* for the position; the other parties put up nobodies for the office. In any event the office would not be filled by a trained geologist. Bad as this state of affairs is, it is no worse than when the officer was appointed. It is but a few years since a mediocre poet and lawyer, without an iota of geological knowledge, was rattling around in the position. There are some geologists in the State, but somehow the politicians will have none of them.—K.

—It is a well-known fact that there is not a little pretty poor science teaching in America, but in many schools this is not to be wondered at, for the pay is correspondingly poor. A certain Ohio

school advertises for an "Assistant Professor of Chemistry, Physics, and Biology; salary $600, with distinct understanding that all salaries for faculty are deducted pro rata if income is not sufficient to pay in full." What can they expect? Doubtless the institution will get all they pay for, but there is another aspect to the question. Are the poor students rightly treated by having their science taught them by such an intellectual smooth-bore as this advertisement calls for?

—A "PROMINENT BOTANIST" sets up a wail in the September number of the *Botanical Gazette* because (so he claims) the zoologists have appropriated and misapplied the term biology. In many a school "Biology" is taught, but the study is all devoted to the animal side of the living world. This is admittedly so, and on a broad etymological basis the use of the word in this way is wrong. Still the zoologists are not wholly without excuse. Fully half of the teachers of botany are utterly unable to give any of the living side of their subject. Analysis is all that they know, and so when the zoologist goes as far as he can, and teaches all that there is taught of life, is he to be blamed for claiming the name?

RECENT BOOKS AND PAMPHLETS.

FRAZER, P.—On a Specimen of Quartz from Australia and Three Specimens of Oligoclase from North Carolina Exhibiting Curious Optical Properties.

——An Unjust Attack. Ext. *Am. Geol.*, Jan., 1889. From the author.

GARMAN, H.—A Preliminary Report on the Animals of the Waters of the Miss. Bottoms, near Quincy, Ill. From S. A. Forbes.

GAUDRY, A.—Le Dryopithèque. Memoire I. de la Soc. Geol. de France. From the author.

General Account of the Instruction and Equipment in the Dept. of Geology at Harvard University, 1890.

GEIKE, J.—The Evolution of Climate. From the author.

GILBERT, G. K.—The History of the Niagara River. Ext. from Sixth Ann. Report Com. State Res. at Niagara. From the author.

GREEN, A. H.—Consolidation of Areas about the City of New York Under One Government. From the author.

LAWSON, A. C.—Note on the Pre-Paleozoic Surfaces of the Archean Terranes o Canada.—The Internal Relations and Taxonomy of Archean of Central Canada. Ext. Bull. Geol. Soc. Am., Vol. I., pp. 163-194. From the author.

LEA, H. C.—The Endemoniadas of Queretaro. From the author.

LEWIS, H. C.—The Terminal Moraines of the Great Glaciers of England. Ext. Proc. British Association, Sept. 1887. From the author.

LINTNER, J. A.—Report on Insects of the State of New York. From N. Y. State Mus. Nat. Hist.

MCGEE, W. J.—The Geological Antecedents of Man in the Potomac Valley. Reprint *Am. Anthropologist*, Vol. II., 1889.—The World's Supply of Fuel. Ext. *Forum*, Vol. VII., 1889. From the author.

MINOT, C. S.—Segmentation of the Ovum, with Especial Reference to the Mammalia. Ext. from the AM. NAT., June, 1889. From the author.

OLIVER, G.—On Bedside Urine-Testing. From the author.

Organization of the Geological Society of America. Bull. Geol. Soc. Am., Vol. I., pp. 1-86.

OSBORN, H. F.—A Review of the Cernaysian Mammalia. Reprint from Proc. Phil. Acad. Nat. Sci., May, 1890.

——Additional Observations upon the Structure and Classification of the Mesozoic Mammalia. Ext. Proc. Phila. Acad. Nat. Sci., Oct., 1888.

——The Origin of the Corpus Callosum, a Contribution upon the Cerebral Commissures of the Vertebrata. Reprint from *Morphologisches Jahrbuch*, Band XII. From the author.

PARKER, J. T.—Preliminary Notes on the Development of the Skeleton of Apteryx. Ext. Proc. Roy. Soc. From the author.

PARKER, W. K.—On the Presence of Claws in the Wings of the Ratitæ. From *The Ibis*.

——On Remnants or Vestiges of Amphibian and Reptilian Structures found in Skulls of Birds, both Carinatæ and Ratitæ. Reprint from Proc. Roy. Soc.

——On the Secondary Carpals, Metacarpals, and Digital Rays in the Wings of Existing Carinate Birds.—On the Vertebral Chain of Birds. Exts. from Proc. Roy. Soc., Vol. XLIII. From the author.

POTTS, ED.—Report upon Some Fresh-Water Sponges from Florida. Ext. Trans. Wagner Free Inst. Sci., Vol. II. From the author.

Proceedings of the Department of Superintendence of the National Educational Association, 1889.

QUILTER, H. E.—The Rhætics of Leicestershire. Ext. Trans. Leic. Lit. and Philosoph. Soc., 1889. From the author.

Report of the Committee on the International Congress of Geologists. Ext. Proc. Am. Ass. Adv. Sci., Vol. XXXVIII.

Report of the New York State Museum of Natural History, 1888.

REYES, A. DE LOS.—Arte en Lengva Mixteca.

ROTH, S.—Beobachtungen über Entstehung und Alter der Pampasformation in Argentinian. Abdruck a. d. Zeitschr. d. Deutsch. Geolog. Gesellschaft, Jahrg., 1888. From the author.

RYDER, J. A.—The Phylogeny of the Sweat Glands.—Proofs of the Effects of Habitual Use [illegible]ne Modification of Animal Organisms. Exts. Proc. Amer. Philos. Soc., Vol. XXVI., 889

——A Physiological Hypothesis of Heredity and Variation. Reprint from AM. NAT., Jan., 1890.

——The Eye, Ocular Muscles, and Lachrymal Glands of the Shrew-Mole. Reprint Proc. Amer. Phil. Soc., Vol. XXVIII., 1890. From the author.

SHALER, N. S.—Tertiary and Cretaceous Deposits of Eastern Massachusetts. Bull. Geol. Soc. of America, Vol. I., pp. 443-452. From the author.

——The Topography of Florida. Bull. Harvard Mus. Comp. Zool., Vol. XVI., No. 7. From A. Agassiz.

SHANNON, W. P.—A List of the Fishes of Decatur County, Ind. From the author.

STEJNEGER, L.—Description of Two New Species of Snakes from California.—Contribution to the History of Pallas' Cormorant. Exts. Proc. U. S. Nat. Mus., Vol. XII. From Smithsonian Institution.

——Notes on a Third Collection of Birds made in Hawaiian Islands by Valdemar Kundsen. Ext. Proc. U. S. Nat. Mus., Vol. XII. From the author.

Studies from the Biological Laboratory of Johns Hopkins University, Vol. IV.

THURSTON, EDGAR.—Notes on the Pearl and Chalk Fisheries and Marine Fauna of the Gulf of Manaar. From the author.

TODD, D. P.—Provisional List of Mammals of Angola and Vicinity.—Terrestrial Physics. Bulls. Nos. 7 and 11, U. S. Scientific Expedition to West Africa, 1889. From the author.

TURNER, W.—Cell-Theory, Past and Present. Address to the Scottish Microscopical Society, 1889. From the author.

WASMUTH, H. A.—Notes on the Pittsburgh Coal-Bed and its Disturbances. Ext. from the *Am. Geol.*, May, 1888.—Studies on the Stratification of the Anthracite Measures of Penna. Ext. Journ. Franklin Inst., Vol. CXXIV., Aug., 1887. From the author.

WEED, C. M.—Biological Notes on Some North American Ichneumonidæ.—Second Contribution to a Knowledge of the Autumn Life-History of Certain Little-known Aphididæ. Ext. from *Psyche*, Vol. V. From the author.

WHITMAN, C. O.—Some New Facts about Hirudinea. Reprint from the *Journal Morphology*, Vol. II., No. 3, April, 1889. From the author.

RECENT LITERATURE.

G. H. Williams's Elements of Crystallography. Holt & Co., New York., 1890, pp. VIII., 250, Figs. 383.—At last mineralogists —practical specialists as well as teachers—are to be congratulated on the appearance of a treatise which discusses the numerous forms of crystallography in such a logical manner that they need no longer confuse the mind or bother the student. Dr. Williams has given us the first clear statement of the beautiful truths of crystallography that has appeared in English. Not only has he done this, but he has produced the best concise treatise on the subject that has anywhere appeared. In this country there has long existed a demand for a connected description of the relation of the various crystallographic forms to each other, in order that the excellent discipline afforded by the methods used in developing these from each other might be availed of in college instruction.

All who have studied crystallography as a system are agreed that no subject exists which has a higher value than this as a corrector of loose thought and hasty expression. Its tardy introduction into the curricula of our colleges has been due more to the lack of a good text-book than to anything intrinsically hard in the subject itself. Happily there is no longer an excuse for the neglect of this important science. The little book before us comprehends within its small volume all of the most essential principles of the science. It is well written, concise in expression, clear in the statement of the thought, and logical in the development of the ideas contained in it.

It opens with the discussion of the molecule, takes up in order the general principles underlying crystallography, treats each of the seven systems in detail, tells something about crystal aggregates, and describes the various methods made use of in the graphical representation of crystals. Both the Naumann and the Miller systems of nomenclature appear side by side whenever the symbol of a plane or form is needed, and so the reader is brought into frequent contact with these two rival claimants for ascendency. The notion of symmetry is everywhere emphasized, and this it is that gives the treatise its logical connection. The book is very well illustrated. It contains few typographical errors, and in general make-up it leaves but little to be desired.

The publishers, as well as the author, deserve the commendation of all mineralogists for their successful attempt to place before the English-reading public a volume which shall be worthy of their unqualified

approbation. It is to be hoped that their venture (for it is a venture to place upon the market such an expensive book as this must have been at such a low price) will prove no less profitable financially than it has proved excellent from a scientific and bibliographic point of view.

We expect an immediate adoption of the book by all the leading colleges in the country, not only because of the importance of the subject of which it treats, but also because of its excellent qualities as a treatise.—W. S. B.

Britton's Catalogue of New Jersey Plants.[1]—This thick volume of 642 octavo pages is one of which the botanists of the country may well feel proud, inasmuch as it is the most complete of any yet attempted in the United States. From the table in the end of the volume we learn that there are:

Anthophyta	1,919	species and varieties.
Pteridophyta	76	" " "
Bryophyta	461	" " "
Thallophyta	3,021	" " "
Protophyta	164	" " "
Total	5,641	" " "

The preface states that "the present work is based, so far as the flowering plants, ferns, and fern allies are concerned, on specimens actually seen and examined by myself, and contained in the State Herbarium above alluded to, or in other collections of repute. The lists of lower plants have been supplied by specialists of high reputation and authority." It is thus an authoritative catalogue, which is susceptible of correction, if need be, at any time in the future.

In discussing the distribution of the plants of the State the author refers to the rocky and mountainous areas of the northeastern portion, the glacial drift of the same region, the lower level of the southern part, and the much greater sandiness of its soil. "Our flora may thus be divided with considerable accuracy into a northern and a southern, whose present distribution has been determined by differences of soil and climate." These are separated by the glacial terminal moraine. "Besides these two main divisions of our flora, there is another, which may be termed the marine and coast group of plants,—species and varieties especially characteristic of the sea-beaches and salt and brackish

[1] Catalogue of Plants Found in New Jersey. (From the final report of the State Geologist, Vol. II.). By N. L. Britton, Ph.D., with the assistance of the botanists of the State and contiguous territory, and of specialists in the several departments of the science. Trenton, N. J.: Printed by The John L. Murphy Publishing Company, 1889.

marshes and meadows. Some of these are plainly forms of upland origin which have accommodated themselves to their saline surroundings, and been thereby slightly changed in structure and appearance, so as now to be evidently distinct from their inland neighbors and relatives, while others appear to be very distinct from any other living forms."

The sequence of the orders of flowering plants is that adopted by Bentham and Hooker in their "Genera Plantarum," with the exception that "the class Gymnospermæ has been moved into its more natural position at the extreme end of the flowering-plant series, and immediately before the fern allies, with which it has more affinity than with the willows and poplars, next to which it has generally been placed." In the citation of names the law of priority is rigidly followed, "the oldest specific or varietal name available being retained, in whatever genus the plant is located, or whatever its rank as species or variety." As to the double citation of authorities the author says: "The method adopted of citing the original author of the specific or varietal name—the only permanent portion of the binomial—in a parenthesis tells us who first named the plant, while the added name behind the parenthesis shows who first brought the names together in their present combination. This method has, with slight modifications, been generally adopted by zoologists and by students of fungi, algæ, lichens, and mosses, and its general use in botany tends to bring all biological nomenclature into harmony."

It may be of interest to note some of the changes of names to be observed in this catalogue, as follows:

Anemone pennsylvanica L. (of Gray's Manual) = *A. dichotoma* L.

Nymphæa odorata Ait. (of Gray's Manual) = *Castalia odorata* (Dryand.) Greene.

Nymphæa reniformis DC. (of Gray's Manual) = *C. tuberosa* (Paine) Greene.

Nuphar advena Ait. f. = *Nymphæa advena* Soland.

Nuphar kalmianum Ait. = *Nymphæa microphylla* Pers.

Dicentra is given as *Diclytra*.

Adlumia cirrhosa Raf. = *A. fungosa* (Ait.) Greene.

Acer saccharinum Wang. = *A. saccharum* Marsh.

Acer dasycarpum Ehrh. = *A. saccharinum* L.

Carya alba Nutt. = *Hicoria ovata* (Mill.) Britt.

Carya tomentosa Nutt. = *H. alba* (L.) Britt.

Carya microcarpa Nutt. = *H. microcarpa* (Nutt.) Britt.

Carya porcina Nutt. = *H. glabra* (Mill.) Britt.

Carya amara Nutt. = *H. minima* (Marsh.) Britt.
Leersia virginica Willd. = *Homalocenchrus virginica* (Willd.) Britt.
Leersia oryzoides Swartz = *Homalocenchrus oryzoides* (L.) Poll.
Phragmites communis Trin. = *P. vulgaris* (Lam.) B. S. P.
Chamæcyparis sphæroidea Spach. = *C. thyoides* (L.) B. S. P.
Pinus inops Ait. = *P. virginiana* Mill.
Pinus mitis Michx. = *P. echinata* Mill.
Picea nigra Link. = *Picea mariana* (Mill.) B. S. P.
Larix americana Michx. = *L. laricina* (DuRoi) B. S. P.

Many other changes might be cited, but these will serve to show the treatment of the vexed question of nomenclature and synonymy. While some of the changes are quite startling and uncomfortable, there can be little doubt that a rigid enforcement of the "law of priority" will eventually result in a greater fixity of names than now exists.—CHARLES E. BESSEY.

The West American Oaks.[2]—Dr. Albert Kellogg began the preparation of a series of drawings to illustrate the oaks, pines, and other trees of the Pacific coast of the United States, intending to accompany them by appropriate descriptions, but death closed his work long before it came to completion. Now, through the munificence of Mr. McDonald and the aid of Professor Greene, the work is brought out in an appropriate form.

The first species figured and described is *Quercus kelloggii* Newberry, which bears a strong resemblance to the eastern red oak (*Q. rubra*). It is the *Q. sonomensis* Benth. of DeCandolle's "Prodromus." Then follow *Q. morehus* Kellogg, *Q. wizlizeni* A.DC., and *Q. agrifolia* Nee, all apparently related, although the first is deciduous and the others evergreen. *Q. hypoleuca* Engelm. is a narrow-leaved species quite distinct from the preceding. *Q. garryana* Dougl. and *Q. lobata* Nee, are closely related, and resemble the white oak of the eastern United States. The last-named species is the *Q. hindsii* Benth. of the Pacific Railroad Reports. *Q. gambelii* Nutt. is still more like the white oak, both in leaf and acorn. It is a shrub of six to eight feet in height, or a middle-sized tree from thirty to sixty feet high, with a trunk three feet in diameter. The tree form is confined to the "middle and higher elevations of the mountains of southern New Mexico and Arizona, and of adjacent Mexico." The smaller form occurs upon

[2] Illustrations of West American Oaks. From drawings by the late Albert Kellogg, M.D., the text by Edward L. Greene. Published from funds provided by James M. McDonald, Esq., San Francisco, May, 1889. 4to, pp. xii + 47, with XXIV. plates.

West American Oaks. Part II., San Francisco, June, 1890, pp. 52 to 84, with plates XXV. to XXXVII.

lower ground from central Colorado and Utah to the borders of Texas and Mexico. It is the *Q. alba* var. *gunnisoni* of Torrey, the *Q. douglasii* var. *gambelii* of A. DeCandolle, and the *Q. undulata* var. *gambelii* of Engelmann.

Of the remaining species the most notable are *Q. chrysolepis* Leibmann and *Q. densiflora* Hook. and Arnott, the latter evidently related to the chestnut (Castanea), both in foliage and fruit. The former enjoys the distinction of being "the most valuable oak of the Pacific forests." Like many other western species, it has passed under several other names, viz., *Q. pulvescens* Kellogg, and *Q. crassipocula* Torrey.

The second part of the work contains plates of ten species and varieties never before figured. It is a supplement to the work of the lamented Kellogg, and is most fittingly added to it. The newly-figured species are: *Q. palmeri* Engelm., *Q. turbinella* Greene, *Q. tomentella* Engelm., *Q. macdonaldi* Greene, and its variety *elegantula* Greene, *Q. fendleri* Leibmann, *Q. jacobi* R. Brown Campst., *Q. gilberti* Greene, *Q. venustula* Greene, *Q. dumosa* forma *polycarpa* Greene.—CHARLES E. BESSEY.

The Flora of Nebraska.[3]—Nebraska has an interesting flora. Its geographical position, stretching from the mountains on the west across the arid plains to the rich prairies on the east, and a midway latitude between north and south, is strong indication of the fact. The well-known catalogue of Nebraska plants by Samuel Aughey, published fifteen years ago, upon data now known to have been sadly defective, contained such a wealth of plant names that it has led botanists ever since to believe in the superior richness of the flora.

The really earnest and careful study of the State flora dates from the connection of Professor C. E. Bessey with the State University at Lincoln. Upon his entrance into the State the collection of a representative herbarium was begun, together with a study of the economic features of the vegetation. Valuable papers upon different portions of the work have been published from time to time, the latest of which is given in the Annual Report of Nebraska State Board of Agriculture for 1889, recently issued.

This paper is the official report of the botanist to the board, and covers 160 pages. The first part is an account of the grasses and forage plants of Nebraska, in which many practical suggestions and comments are introduced. So far 106 native species are known within the State, and 22 kinds that have been introduced as weeds. The

[3] The Grasses and Forage Plants of Nebraska. By Charles E. Bessey, Ph.D. Catalogue of the Flora of Nebraska. By Herbert J. Webber, M.A. In Report of the Nebraska State Board of Agriculture for 1889. Lincoln, 1890.

cultivated grasses and some of the forage plants also receive attention; and notes upon cultivation, use of irrigation for meadows, diseases of grasses, and other topics make the report of great value to the Nebraska farmer. In the preparation of part of the topics Professor Bessey has been assisted by his pupils, Herbert J. Webber and Jared G. Smith.

The second part of the report is a catalogue of the flora of Nebraska, prepared by Mr. Webber under Professor Bessey's direction. This is in every way an admirable local flora. It embraces all manner of plants from the humblest protophyte to the most exalted anthophyte. The total number of species listed reaches (by a curious coincidence) 1890. From Professor Bessey's well-known views certain things among the departures from the commonly-accepted form in local floras, such as the arrangement of groups in an ascending order, the use of "phyta" as a uniform termination for the names of the grand divisions, and the decapitalization of specific names, were to be expected; but in the present instance we meet with an unlooked-for innovation in the use of Luerssen's arrangement of the phanerogams instead of one of the common American or English systems. This abolishes the division of Apetalæ, distributing the orders of this group according to their affinities, and brings the Compositæ at the end of the list as representing the highest development of plant life. Many minor changes of arrangement will be noted by the student, and especially the attempt to follow the most advanced views in both arrangement and nomenclature.

A feature of the work to which too much praise cannot be accorded is the indication under each species of the particular herbarium in which the specimen on which the determination was made can be found. This makes it possible to re-examine the data for any part of the catalogue desired, should the necessity for doing so ever arise. Could this practice be made universal the days of slight appreciation of local lists would soon be past, and they would become an important factor in the study of geographical distribution, etc., instead of being largely ignored as heretofore.

Further interesting features of this catalogue might be mentioned. It will undoubtedly serve as a model for other collectors who are ambitious to embody the results of the latest studies in their local lists, a desire which should not be discouraged.—J. C. ARTHUR.

Physikalische Krystallographie,[4] by Dr. Th. Liebisch, is an excellent treatise on the physical properties of crystals as distinguished from uncrystallized bodies. An introduction of fifty pages discusses the differences between crystallized and uncrystallized substances, and

[4] Leipzig, Veit and Comp., 1891, pp. VIII., 614, 298 fig., 9 tables.

the characteristics of the crystallographic systems. Then follows a statement of the deformations suffered by crystals under the influence of various agencies. The thermal, electric, and magnetic properties of crystallized material is next described in great detail, no less than one hundred and thirty-eight pages being devoted to these subjects. The optical properties of these bodies are next considered, and two hundred and sixty-three pages are occupied in their treatment. Elasticity is next discussed in a separate chapter, while the tenth and final chapter treats of the relations existing between the elastic, optical, and the electric properties of crystals.

Although the discussions are, on the whole, too mathematical for most mineralogists, there is much material in the book that will prove of great value to them; while the mathematical portion should be very welcome to physicists, who pay far too little attention to the physical properties of that most important class of bodies,—crystalline substances.—W. S. B.

The Catalogue of Minerals[5] published by Messrs. George L. English & Co., Philadelphia and New York, is not merely a catalogue of specimens offered for sale by the above firm, but it is also a handbook of the new and rare minerals recently found in the United States and other parts of America. About thirty pages of the little volume are reprints of the descriptions of these minerals as found in the original articles of the authors first describing them. Following these is a classified list of minerals, with their composition and crystallization. Finally, an alphabetical index to mineral names completes the volume, which is such an excellent little compendium of matters mineralogical that it will surely find a place upon the shelves of all lovers of minerals. Bound copies of the catalogue we believe are for sale by the publishers at a nominal price.—W. S. B.

We have received from Burnz & Co., of 24 Clinton Place, N. Y., a pamphlet with the the modest title of "Diana," by Mrs. E. B. Burnz. The wisdom which is therein set forth consists of a theory of the sexual nature of man which divides its manifestations into two categories, one functional, the other affectional. The author sets forth her belief that the latter of these is the proper outlet for surplus sexual energy, and that proper gratification of the affectional desires would operate as a safety-valve, so to speak, in preventing abnormal outbreaks of the desire for the functional manifestations. This proposition must stand or fall by the facts of the human organism, mental and physical, as we find them. We admit that the pamphlet brings an obstacle to its reception along with it in the new phonetic spelling which the author has adopted. However, we would not have this prejudice sturdier readers from attempting to judge for themselves.

[5] Fifteenth Edition, June, 1890, pp. 100.

General Notes.

GEOGRAPHY AND TRAVEL.

(*Continued from page 946.*)

Honduras.—Still rising before us are numerous peaks and mountains in different forms. We notice that their tops are crowned by huge barren rocks,—a porphyritic cap. Before ascending these heights we are enabled to trace, in our imagination, the original magnitude and extent of this formation, now only left to us in huge rounded masses or other peculiar forms, in the shape of walls or even columns. Some of the summits have disappeared, but we will find them as debris accumulated at the base. The lithological character of this debris answers in every respect to those rocks, which have remained as monuments of a nearly-destroyed rock-formation once crowning the heights of the Pacific slope of Honduras.

The surface of the mountains is deeply ravined and supplied with creeks, and deep gulches separate the once coherent mountain masses. These wide gulches and river beds are as characteristic of Honduras as the absence of narrow canyons.

The presence of gulches and the absence of narrow cañons in that country is caused by the extreme variation of the water supply by rains in this tropical zone, and its steep slope, producing rapid drainage.

By aid of heavy rains streamlets may pass into torrents, and later into floods, demanding a large area for their agitated waves, which rapidly sweep down the steep slope of the mountain region. There is no rock material in existence which could restrict the suddenly-aroused masses of water into a small or limited area. The surrounding and enclosing rocks are dislocated and carried away till the fierce element has satisfied its demands.

Meteoric events are thus the makers of scenery; the latter will change as soon as the former will assume other conditions, and therefore they are in close relation to each other.

I make a few remarks about the present climatic condition of Honduras. Contrary to ordinary or common belief, Honduras has a a salubrious, healthy climate. The thermometer rises on the low coastlands from 80° up to 100°, but the latter quotation may be considered as one of the high extremes. In an altitude of 2,500 feet we will

encounter a constant temperature of about 75–90° F. the whole year round. At 3,500 feet, for example, the altitude of the capital of Honduras, Tegucigalpa, is 70–80° F.; and at Santa Lucia, 4,500 feet, a temperature of 68–75° F. The yearly variation of the already-mentioned places is between 10–15° F., whilst their daily difference is about 5° F. Towards evening northern breezes set in regularly, and render the nights pleasant and comfortable.

The rainy season commences on the Pacific side towards the latter part of April. Heavy showers of rain, accompanied by the constant rolling of thunder and the blinding flash of lightning, occur towards evening, and usually last during the night. The following day is bright, with pure and balsamic atmosphere. Towards the end of the rainy reason the storms commence in the afternoon, and heavy showers may fall continuously during two or three days. We would suppose that the small area of Honduras, which covers only three degrees of latitude, would have a nearly uniform season over the entire territory, which is not at all the case. The rainy season gradually advances from the Pacific coast towards the interior, and from there to the north coast. It thus happens that the Atlantic and Pacific coasts are polar, or opposite, in regard to their seasons. In January the dry season is prevailing on the Pacific coast, whilst there is a wet season on the Atlantic shores. In the interior of Honduras rains are less powerful, but they usually continue longer. On the Atlantic slope the rains are heavier than on the Pacific, which is, most likely, caused by the more vigorous growth of vegetation on the latter coast.

It is quite evident that a territory which originated chiefly through the aid of plutonic and volcanic agency is destined to be most diversified in regard to the diffusion of its valleys and mountains, and more so if we remember that the huge edifice, the Central American continent, is not the effect of *one* upheaval of firm land, or one sudden rise of fused mineral masses, but that this process was a gradual and periodical one, consisting of sudden eruptions, followed by long pauses of rest.

As these eruptions occurred at different times, it may follow that the direction of the eruptive mountain ranges was likewise divergent, which is actually the fact.

Over the whole territory of Honduras there are spread numerous systems of mountain ranges, which usually are called in that country "montanas," and montanitas if of a smaller size. On the western boundary of Honduras these ranges run *usually* from north to south; as, for example, the montanas de Monticillos and the montanas de

Yojoa, whilst on the western portion of this country the mountain-ranges extend nearly from east to west, as is the case with the montanas de Jutegalpa, and the montanas de Tonpocente.

We have thus in Honduras two main directions of mountain extent, —north to south, and east to west,—with a great series of other ranges, which intersect the above directions at various angles.

The zone of extension of these ranges is usually not in form of straight lines, but bent or curved, passing even into a circle, in which case the whole range, with its enclosed surface or valley, assumes a huge crater-form. A similar effect is sometimes obtained by the accumulation of mountain or mineral masses of a different lithological character in a peripheric zone, around an undisturbed centre.

Most of the ranges which present this curved zone of accumulation are but sections of large circles, or waves of undulation, in the center or height of which the protrusion of fused masses occurred.

The topographical structure of Honduras, with its diffused arrangements of mountain ranges of different eruption centers, is therefore most favorable for a display of numerous valleys, which are formed at the expense of large plateaux.

In regard to the shape and origin of the valleys of Honduras, we may make the following classification. Valleys are formed:

1. By the folding up of upheaved, undulating mountain masses.

2. By the accumulation of eruptive masses around an undisturbed center.

3. By the erosive action of water.

The first class of valleys is not often found in Honduras; they principally occur toward the Atlantic or plutonic coast.

The second class is of most frequent occurrence, usually of volcanic origin. Their manner of formation has been already explained by the deposit of fused mineral masses, around a centre which is the actual base of the valley.

The common form of valleys of this class is a round or elongated one, but various other shapes occur, as, for example, oblong ones, as the result of the intersection of two parallel mountain ranges. In fact, it would be impossible for me here to describe the diversified aspects of this class of valleys, originated as already explained, but subjected to manifold alterations by previously-existing objects.

I proceed to another group of numerous valleys, which I may call crater-valleys, as they are nothing but craters or vents of volcanic ranges now inactive. Their ordinary form is circular, and the base of the valleys is from two to ten miles in diameter. Usually they occur

in series of from two to six valleys, arranged in a linear direction, and only separated from each other by narrow mountain-ridges, at an elevation above sea level of from six hundred to twelve hundred feet. Such a linear arrangement of crater-valleys we encounter on the volcanic side of Honduras, the Pacific coast, in the neighborhood of the village of Langli.

Before reaching the village we arrive at the foot of the volcanic range, the top of which is provided with a series of craters, formerly the theatre of fiery eruptions, now partly covered with vegetation and inhabited by man.

We ascend the ridge of the mountain range and arrive at its top, when we descend its steep slope, traverse the plain of the valley, and ascending again we find on the top, below us, an exact similar valley as that of Langli, and so on until we have traversed the whole range.

This form of ranges, with their tops provided with a series of funnels or craters, has great resemblance to those which I have previously described as presenting a series of peaks or cones on their summits arranged in a linear succession. In fact, we may call it the same, with the only difference that in the first-mentioned case the figure of the peak or cone is most prominent, whilst in the second case (the valley arrangement) the form of the crater or funnel is more decidedly expressed by nature. These two mountain forms stand in the relation to each other as do the matrix and the mould.

Our third class of valleys—the *erosive valleys*—are, as their name expresses, caused by the erosive action of water, and are the products of the drainage of Honduras. They are of comparatively modern origin, and contain river beds which during the rainy season carry enormous masses of water, producing further erosion, and with it an extension of the valleys in regard to width and depth.

In order to obtain a complete survey of the various past epochs up to the present time let us once more return to the tertiary period.

The idyllic and picturesque valleys of the present Honduras were then for the greater part the theatre of volcanic activity. After a long elapse of time the fiery, eruptive zones cooled down, assisted in this process by water, which came in the form of rain or aqueous ebullitions from the craters. A great number of these craters became thus filled up with water, forming lakes. By aid of the drainage of the volcanic mountain slope, which enclosed, as previously mentioned, large tracts of land, thus forming valleys, the latter were transformed into basins, which became covered with water, thus passing into lakes of large dimensions.

The existence of a large *lake area* during the diluvial period, which I found to have extended nearly over the whole territory of Honduras, is not merely based upon the theory of a necessary accumulation of water in natural basins, on account of the absence of erosive valleys or river systems, but it is founded upon the existence of well-preserved shore-marks and shore-lines of these former lakes.

The lines of the erosive action upon the mountains surrounding our present valleys extend in a *horizontal* direction, dividing the slope of the mountains into two zones, one acted upon by water, the other by air and vegetation, but destitute of these marks. The lines of demarkation between the sea level and the shores are as well preserved and marked as if the lakes were still in existence.

These lines of erosion are *horizontal*, and not *inclined* as those produced by river erosion, and are therefore a strong evidence of the existence of accumulated water or lakes in those valleys bearing those shore-marks.

Descending from the height of the lake shores to the base of the valley, we find in sinking a shaft stratified formations of soil, sand, and clay, containing animal remains. At the present time these lakes have disappeared, but we have one illustrating example left in the form of the lake of Yojoa. This system of former lakes stretched across Honduras. I may mention, as former lake-beds, the valleys of Tegucigalpa, Comayagua, Danli, Portrerius, Santa Barbara, and a great portion of the province of Olancho.

There is an old Indian legend extant among some Indian tribes of Central America which tells us of an underground passage connecting the Atlantic and Pacific oceans, in the form of a natural canal, used by their ancestors for navigation. Might this tradition not have reference to an overground passage through those lakes existing in former or ancient times, perhaps even in the early era of man? The topographical arrangement of the present valleys, formerly craters, passing into reservoirs of lakes, would form a great deal of probability for our supposition, and more so as a similar passage is proposed in the Nicaraguan canal project, which would utilize the existence of the two large lakes, Managua and Nicaragua, which unite, by aid of the river San Juan, with the Atlantic.

The large amount of water spread in ancient times over Honduras must have caused heavy rainfalls, a vigorous growth of vegetation, frequent earthquakes and new eruptions of volcanic material.

These results combined contributed to the wear of the banks of those lakes, and the enclosed water masses found their way to the sea,

forming large erosive valleys with river systems connecting the interior directly with the briny waves of the oceans. By aid of this new system of draining the territory a considerable number of lakes lost their former supply of water. Gradually they began to evaporate, lowering constantly their shore-marks, till they were reduced to swamps, and from this passed into the present fertile valleys which we find so frequently in Honduras.

During my exploration in Honduras I never observed glacial marks. The absence of these self-registered graphical records of moving ice masses, would imply either that the glacial period did not exist as such in Honduras, or that the marks or engravings of that period may have been destroyed by the action of water and vegetation. The latter case seems very probable, but the absence of real glacial *moraines* in this country is a strong indication of the non-existence of the glacial period.

The luxuriant forests which, without doubt, have surrounded those *ancient* lakes were inhabited and visited by gigantic mastodons and alligators, numerous remains of which we frequently find in a state of good preservation from ten to fifty feet below the alluvial grounds of former swamps or lakes. As mastodon localities I mention the valleys of Danli, Portrerius, Santa Gracias, Santa Rosa, Santa Barbara, and Olancho. Inasmuch as we find nearly whole skeletons of mastodons in certain places, we may conclude that these animals existed in close neighborhood to their present burial-places, and were not carried from afar by streams or rivers. The mastodon remains are in size and form nearly corresponding to the New York mastodon, with the exception that the tusks of the Hondurian mastodon are less curved, and are therefore nearly straight. With the lakes disappeared also the gigantic mastodon, but of their associates, the tapir and the wild boar have been left behind in present Honduras.

A new scene—a psychozoic one—is going to unroll itself before our eyes. The swamps have partly passed into fertile grounds, covered with valuable woods, inhabited by animals, which provide an abundant supply of food for man, and richly impregnated with mineral substances, which were ejected from the interior of the earth through large fissures in which they deposited, forming mineral accumulations of considerable value.

Such was the country given by nature to daring man! He soon appears before us, not as an uncivilized giant or savage, but as a man accustomed to comfort and experienced in art and music. In Honduras no *woeful remains* of giants are found, and most likely never will be discovered; but we find, nevertheless, abundantly, genuine remains,

in form of temple and sacrificial mounds, containing vases, idols, ornaments, and arms.

From the character of the painting on a large vase, in excellent preservation, excavated at Oropoli, in Honduras, we feel strongly inclined to attribute the vase to a nation who came in contact with Israelites, Persians, or Egyptians. The face of the main figure is of Hebrew cast; the costume is Asiatic; Persian hat, with Egyptian veil or head-dress, and long narrow boots; seated on a high Egyptian throne, holding two clarionets in the hand. The scene represented is that of snake-charming, which art is usually found with Asiatic people. If we remember that the Phœnicians, whose history is yet half concealed in the dim twilight of human records, penetrated far out on the Pacific ocean, we must not wonder if future archæological discoveries in Mexico and Central America should prove a close relation between the Aztecs, or the first settlers in Honduras, with an Asiatic people who might have reached the shores of the New World by aid of navigation.

With these archæological remains, which indicate a high grade of civilization on the part of their manufacturers, we find sometimes crude implements, as arrowheads, hatchets made of greenstone, idols of clay and jade. The idols of this race are also of an Asiatic character. There are yet direct descendants of this race living in Honduras, usually called Indians, but their whole appearance, their plays and traditions, are Asiatic. How did this race reach Central America? is what we ask. Most likely by emigration from Asia *via* Behring Strait to North America, and from there to Central America, in a similar manner as the mastodon extended its migrations from the southern part of Europe, Asia, and North America down to Central America.

The Asiatic or Mongolic tribes, as, for example, the Alans and Huns, at an early period of our history undertook large migrations, conquering a large portion of Europe. Should not similar large Asiatic migrations have extended towards the northern part of Asia, driving its inhabitants over the Behring Strait to the American continent?

The American continent, probably once known to some Asiatic people, became forgotten.

On the 14th of August, 1502, the precise records of history mention the American continent in their annals. On that date Christopher Columbus appeared before the Cape Casinas on Honduras territory, and entered for the first time the American continent as the first stranger who rediscovered America in our historical time.

We know enough of the cruel Spanish systems of oppression and barbarities. The Spaniards were compelled on the 15th of September, 1821, after some struggle with the natives of Central America, to resign their assumed rights over that country and its people.

Central America divided itself politically into the republics of Honduras, Guatemala, Salvador, Nicaragua, and Costa Rica, all of which abolished slavery as one of their first acts. Honduras, a constitutional republic, is at the present time in a very prosperous condition. Its doors are opened for commerce, and its coasts and interior offer ample rewards for the industrial enterprises of man. The wheel of time, producing changes, is never at rest. M. J. R. FRITZGAERTNER.

GEOLOGY AND PALEONTOLOGY.

On a New Dog from the Loup Fork Miocene.—AELURODON COMPRESSUS sp. nov. Represented in my collection by a single mandibular ramus of the left side, and by two rami in the collection of the Museum of Comparative Zoology of Cambridge. The latter have been referred by Professors Scott and Osborn to the *Ae. hyaenoides* Cope (Bulletin Mus. Compar. Zoology, 1890, December), but I find on direct comparison with the type that the species is different. When the heel of the inferior sectorial is placed in position on the first tubercular superior molar of the *Ae. hyaenoides*, the second superior tubercular of the latter does not reach the second inferior tubercular of the *Ae. compressus;* and the posterior border of the superior canine marks the middle of the penultimate inferior premolar of the latter.

The canine in the *Ae. compressus* is rather small, while the sectorial and first tubercular are large. The fourth premolar is one-rooted, and the third has two distinct roots, and is nearly as large as the second. The crowns of these teeth are not preserved in the specimen. The first inferior premolar is not so robust as in the *Ae. sævus* Leidy and other species, but is more compressed. It has a strong posterior cutting lobe, and a low posterior basal cingulum. No anterior basal cusp or cingulum. The heel of the sectorial is as wide as long, and is half as long as the blade. The anterior border of the latter overlaps a little the heel of the first premolar on its inner side. The borders of the heel are of equal elevation. Roots of first tubercular divergent. Root of second tubercular compressed and situated on the oblique base of the coronoid process. The ramus mandibuli is rather shallow

and robust. Its inferior border is nearly straight to below the second root of the first tubercular. It is there strongly curved upwards, in a regular convex outline. There are two mental foramina, one below the second, the other below the third premolars. The alveolus of the external incisor is large, and is directly in front of the canine. The symphysis extends posteriorly to the middle of the pm. iii.

Measurements.—Length of dental series, inclusive of canine (in a straight line), 73 mm.; of premolar series, 30 mm.; of sectorial, 19 mm.; of base of $\overline{m^2}$, 10 mm.; of alveolus of $\overline{m^3}$, 5.5 mm.; length of heel of sectorial, 6 mm.; width of do., 6 mm. Depth of ramus at pm. iv., 15 mm.; at front of $\overline{m^2}$, 18 mm.

From the Loup Fork Miocene of Nebraska.

In illustration of the general characters of the genus Aelurodon, I give a restoration of the skeleton of the *Ae. sævus* Leidy, from a mounted specimen in my collection. The shaded parts represent the bones in my possession.—E. D. Cope.

On Dendrophycus triassicus Newb.—In the last number of the Naturalist is a paper on "Variation," by Professor Joseph F. James. Much of the matter of that paper is interesting and valuable; but there is one paragraph, on page 1080, to which I decidedly object. It does injustice to me and discredit to the author. The passage is as follows:

"Even in one of the latest monographs published by the U. S. Geological Survey (Vol. XIV.) we observe an inorganic marking (as it appears to us) masquerading under the name of a sea-weed; and under a new name, too, because its brother rill-mark existed some geological ages prior to its own oncoming formations."

This paragraph must refer to my *Dendrophycus triassicus*, since there is no other sea-weed described in the volume, and I remark upon the resemblance which this bears to *Dendrophycus desorii* Lesq., from the Pottsville red shale (Lower Carboniferous).

Now, as Mr. James has probably never seen a specimen of the plant I described, and certainly has never seen the type specimens, he seems to me hardly qualified to express an opinion upon the subject. Besides that, there can be no question that *Dendrophycus triassicus* is a plant, and not a rill-mark. I have been for half a century studying rocks and fossils in the field, and have given special attention to fossil plants; hence I ought to be qualified to decide whether the impression in question is of mechanical or organic origin.

I am familiar with the discussion which has taken place between Dr. Nathorst and the Marquis de Saporta about fossil algæ, tracks, and

trail-marks, and I know how dogmatically Mr. James has written on the so-called sea-weeds of the Cincinnati group; and yet I can see no reason for doubting that Dendrophycus is organic, and no excuse for the confidence with which Mr. James pronounces an opinion upon a subject of which he really knows nothing. Nobody doubts the organic character of Spirophyton; but no one can compare Dendrophycus with the various species of Spirophyton which occur in the Cauda-galli grit, and thence upward into the Coal Measures, without seeing that they must go together. Still further, no one can compare good specimens of Dendrophycus—those showing the extremities of the fronds—with sea-weeds of the genus Desmarestia without finding so much in common as to be convinced that they are nearly related. This similarity was remarked by Professor Balfour, to whom the plant of the Umbral shales was referred by Professor Rogers. We find in both the same cylindrical, firm, hard and smooth stems, dichotomously forked, becoming at their extremities wire-like, and terminating in slender, acute points. In Dendrophycus, as in Desmarestia, many of these terminal branches are set with lateral, acute, alternate thorns. Any one who will examine *the specimen*, part of which is figured in Monograph XIV., U. S. Geological Survey, Pl. XXI., Fig. 2, will, I think, regard the theory that it is a rill-mark as untenable. To all those who have been led to such a conjecture by the imperfection of the figures given, or the positive tone of Mr. James's paragraph, I can only say, examine the specimens and that idea will be no longer entertained.

In order to get all the light possible on this subject, I sent some specimens of Dendrophycus and Spirophyton to Professor W. G. Farlow, of Cambridge, our highest authority in all that pertains to the algæ; he kindly gave me the result of his examination of these specimens in a letter of considerable length, in which he expresses the opinion that they are organic and not of mechanical origin, and that they are the remains of sea-weeds. Had Mr. James waited until he could have seen the specimens of Dendrophycus, I venture to say he would never have given expression to the dogmatic and even contemptuous opinion which is contained in the paragraph I have quoted.

J. S. NEWBERRY.

New York, Nov. 7th, 1890.

MINERALOGY AND PETROGRAPHY.[1]

Petrographical News.—A most important contribution to the study of the origin of the crystalline schists has lately been made by Van Hise,[2] through the medium of the Bulletin of the recently organized Geological Society of America. It will be remembered that only a short time ago this writer[3] showed that certain mica-schists of the Penokee-Gogebic region in Wisconsin and Michigan are nothing less than sediments, in which secondary mineral changes have taken place. He now goes further, and shows that under the influence of pressure, and probably heat, the pre-Cambrian slates and conglomerates of the Black Hills, Dakota, have been changed into schistose rocks, among which are gneisses. The reasons given for this conclusion are: (1) The gradation of the slates into schists, with loss of slaty cleavage, and the development of a foliation, usually oblique to the cleavage, and sometimes even perpendicular to it; (2) the concentric arrangement of the schists around granitic areas in such a way that the strike of their foliation is always parallel to the boundaries of the eruptive rock, and the dip always inclined away from them; (3) the clear evidence afforded by the microscope to the effect that the rocks intermediate between the schists and slates have all suffered squeezing to such an extent that their various constituents, more particularly the quartz, have been flattened, cracked, and even broken, so that their different parts extinguish differently; and finally (4) the certainty that much of the material of the schists is of secondary origin. The new minerals produced by the forces at work are silica in different forms, biotite, muscovite, and feldspar, and sometimes hornblende, garnet, tourmaline, and staurolite. In the less schistose varieties the grains of the original slates can be distinguished, as they are outlined by a layer of ferrite deposited upon them before they had lost their characteristic shapes. The quartz grains are flattened in the direction of the line of supposed pressure, and are broken. The cracks are often filled with particles of iron oxides, and sometimes are marked by lines of fluid inclusions. The deposition of silica around the fractured quartz grains and the production of secondary mica and feldspar are regarded as abundantly able to change a slate into a schist, especially when foliation has been

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Bull. Geol. Soc. of Am., Vol. I., p. 203.

[3] AMERICAN NATURALIST, Aug. 1886, p. 723.

superinduced by pressure, with the aid of heat sufficient for the fusion of the original sediments. Attention is called to the fact that these schists are not members of the great complex underlying the earliest sedimentary rocks, but are contemporaneous with some of the latter which are probably of Huronian age.——After a very thorough discussion of fifty-three analyses of plutonic and effusive rocks Rosenbusch[4] concludes that the cause of the great variety in the rocks extruded from an eruptive center is the capacity of an original magma for separating into portions with different compositions (Spaltungsfähigkeit). These different portions may exist under the earth's crust in positions very near each other. From the very nature of the discussion, depending as it does upon so much detail, it is impossible to reproduce its argument in these pages. It must satisfy our present purposes to state that Prof. Rosenbusch thinks the original magma had a composition near that of a mixture of elæolite-syenite, peridotite and residues of the formulas $(NaK)AlSi_2$ and R_2Si. The residue $(NaK)AlSi_2$ possesses the capacity of taking up silica and yielding granite magma. The first splitting of the original magma yielded derivative magmas (theilmagmen), which have solidified as plutonic rocks. Further differentiation produced the materials whose solidification yielded the effusive rocks. This explanation of the differences existing in the composition of the plutonic rocks and their corresponding effusives is thought by Rosenbusch to be better than that which ascribes them to a separation of the original magma according to the density of its parts, whereby the highest portions (those producing the effusive rocks) had of necessity a different composition from the lower portions. The paper contains significant utterances with respect to the relations between the geological age of a rock and its structure. It is said that the difference between older and younger effusive rocks is "that the former have existed on the surface for a longer time than the latter, and consequently have suffered a series of changes (umbildenden Processen) . . . One needs no great gift of penetration to prophesy that in the near future this separation [of the paleovolcanic from the neovolcanic rocks] will lack recognition."——Dahms[5] has examined a set of hand-specimens brought from the Transvaal, Africa, among which he recognizes gabros containing pleochroic diallage and augite, the two minerals occurring in different parts of the same mass, and secondary quartz and hornblende. He finds also diabases and quartz-diabases, a quartz-porphyry in whose quartz-phenocrysts are inclusions

[4] *Miner. u. Petrog. Mitth.*, XI., 1890, p. 144.

[5] *Neues Jahrb. f. Min.*, etc., Beil. Bd., VII., 1890, p. 90.

of carbon-dioxide, augite-porphyrite, granite, and granitic and syenitic porphyries. Each of these rocks is described, and analyses of several of them and their constituents are given. The most interesting point brought out by the analyses has reference to the relation between the diallage of a gabbro and the secondary hornblende derived from it.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	Na_2O	K_2O	H_2O
Diall.	53.53	3.12	5.09	13.54	6.19	18.77	.57	.20	
Hornb.	52.73	4.70	5.26	10.21	12.58	12.59	.23	.06	1.54

An increase in CaO and decrease in MgO in passing from diallage to hornblende is in opposition to the view held in regard to the nature of the change. The author is compelled to look upon it as paramorphic. ——Cathrein[6] has re-examined the rock from Ehrwald in the Tyrol, called by Pichler augite-porphyry, and thought by Rosenbusch to belong possibly with the teschnites, and has found it to consist of phenocrysts of augite, both monoclinic and orthorhombic, in a ground-mass composed of crystals of biotite, pyroxene, hornblende, apatite, and magnetite, in a base containing some radially fibrous mineral in an isotropic substance. The rhombic-pyroxene has been changed to bastite, which is intergrown with biotite and augite, and is surrounded by small crystals of augite of the second generation, of hornblende, and of biotite. The augite of the ground-mass is grouped in aggregates resembling chondrites, and is pleochroic in violet and yellowish-red tints. The author classes the rock with the augitites, and calls it bastite-augitite or Ehrwaldite.——Spherulites composed of radiating bundles of an alkaline feldspar and spherical masses of tridymite occur in the obsidian of the Lipari Islands, according to Mr. Iddings.[7] They are similar to the spherulites and lithophysæ of the rock from Obsidian Cliff, and contain, like the latter, little honey-yellow crystals of fayalite.——In an appendix to an article by Mr. Barlow[8] on the contact of the Huronian and Laurentian rocks north of Lake Huron, Dr. Lawson briefly describes a few sections of quartzites on the contact with gneisses, in the former of which he believes are evidences of contact alteration, in which event the gneisses must be regarded as eruptive.——Mr. Fairbanks[9] has examined eighty sections of basic dykes from the north shore of Lake Huron, and has found them to be diabases, diorites, and alteration products of these.

[6] *Verh. d. k. k. geol. Reichsanst*, I., 1890, p. 1.

[7] Iddings and Penfield, *Amer. Jour. Sci.*, July, 1890, p. 75.

[8] *Am. Geologist*, July, 1890, p. 19.

[9] Ib., Sept., 1890, p. 162.

Mineralogical News.—In two very much decomposed rocks from Custer County, Colorado, Mr. Cross[10] has discovered an interesting series of secondary *hornblendes* and *pyroxenes*, whose study leads him to the view expressed by Williams, viz., that the most convenient way to place hornblende crystals in order to show their relations to pyroxene is with the orthodome in the position of the basal plane. One of the amphiboles described is a blue variety with the pleochroism of glaucophane. It is found in a rock composed of green pyroxene and small pieces of brown hornblende, imbedded in a matrix of quartz, calcite, and minute blue and green amphibole needles. It is an alteration product of the brown hornblende and the augite, from both of which it results either directly or through the interposition of actinolite. Both the latter mineral and the blue hornblende are also found as enlargements attached to the clinopinacoidal and terminal planes of the brown hornblende and the augite. The axis of greatest elasticity of the blue hornblende is inclined 13° to 15° to the vertical cleavage, and is on the same side of it as in the case of glaucophane, actinolite, etc., while in common hornblende it is on the opposite side, since the extinction angle is here the angle included between *c* and the axis of least elasticity. The optical angle of the blue amphibole is large, and the absorption is $A > B > C$. A second rock in which the mineral occurs is a conglomerate, in pebbles in which the same relations exist between the hornblendes as those mentioned. A second rare variety of amphibole discovered in these rocks is of a rich chestnut-brown color, and has an extinction of 8°. It is regarded as an added growth. An emerald-green secondary augite occurs in diorite pebbles in the conglomerate above mentioned. It is an alteration product of the blue hornblende and of an unknown yellow mine r Its axis of greatest elasticity is but slightly inclined to *c*. Its pleochroism is strong in green and yellow tints, and its absorption as follows: $A > B > C$. Upon comparing the properties of these minerals with those of other members of the amphiboloid group Mr. Cross is inclined to regard the chestnut-brown hornblende as closely allied to *barkevicite*, while the blue variety is either *arfvedsonite* or *riebeckite*. The green augite is considered to be *ægerine* or *acmite*. Twelve diagrams exhibiting the relations of the axes of elasticity to the crystallographic axes of the different varieties of amphibole and pyroxene accompany the article. If the plane usually taken as the orthodome in hornblende and augite is made the basal plane, the relations shown by the diagrams are rendered quite simple; whereas if the usual

[10] *Amer. Jour. Sci.*, May, 1890, p. 359.

orientation is accepted the relations are not apparent. The paper is important as affording strong argument for a change in the position of crystals of hornblende and augite, as also for the interesting announcement of the discovery of a secondary augite.——The parting of certain hornblende crystals from St. Lawrence County, N. Y., analogous to the basal parting of augite, has been found by Williams[11] to be the result of twinning along gliding planes parallel to the face usually regarded as the orthodome. Since the parting in augite takes place parallel to the basal plane, and since in parallel growths of hornblende and augite the parting in the two minerals is parallel, it is suggested that in both cases the plane parallel to which the parting takes place be taken as oP. The advantages of this new position lie in the correspondence between the morphological and optical properties of the two minerals.——Crystals of beautiful blue *celestite* are described by Williams[12] from the Helderberg Limestone in the western flank of Knobly Mountain, Mineral County, West Virginia. They occur in flattened lenticular pockets, partially or entirely filled with clay. The crystals, which are associated with gypsum and calcite, are found implanted on the walls of the cavities or imbedded in the clay. The celestite is pyramidal in habit in consequence of the predominence of the brachypinacoid $\breve{P}\bar{4}$. In some crystals these faces occur alone, when the crystals are often rounded into lenticular bodies. Other forms observed are $\infty P\bar{\infty}$, $\frac{1}{2}P\bar{\infty}$, oP, $P\breve{\infty}$, and ∞P. oP is rough and drusy, and $\infty P\bar{\infty}$ is vertically striated. The optical angle is $2V_{Na} = 49° 54'$, and composition almost pure $SrSO_4$. The resemblance in habit between these celestites and thinolite,[13] and their similarity with the Sangerhausen pseudomorphs that have generally been referred to gaylussite, are striking.——Becke[14] has examined some highly modified *dolomite* crystals from the Binnenthal and from Scaleglia, and *magnesite* from the latter locality, and on the former has found some new rhombohedra. The dolomite from Scaleglia is marked by unsymmetrical etched figures that differ in shape from those artificially produced on this mineral. The magnesite is interesting, as it contains two orders of scalenohedra, the first forms of this kind found on the mineral. The hemihedral crystallization of calcite, siderite, and magnesite, and the tetratohedrism of dolomite are explained in accordance with the Sohncke-Wulff theory, by the fact that the latter's molecule comprises

[11] *Am. Jour. Sci.*, May, 1890, p. 352.

[12] Ib., March, 1890, p. 183.

[13] Dana. Bull. U. S. Geol. Survey, No. 12, 1884.

[14] *Miner. u. Petrog. Mitth.*, XI., 1890, p. 223.

two metallic elements of different kinds, while in the former the metal is of but one kind. A full list of forms that have been discovered in dolomite is incorporated in the descriptive part of the paper.——Mr. Kemp[15] communicates a few notes on some peculiar *calcite* crystals, and also on tourmalines, sphenes, and magnetites that have been subjected to pressure. The magnetite is striated as a result of the pressure, which has produced a parting apparently parallel to O and ∞ O. The minerals were found in the vicinity of Port Henry and Mineville, N. Y. ——A new analysis of Cornwall *connellite* by Penfield[16] shows it to be analogous in composition to the new mineral spangolite. Its formula may be written $Cu_{15}(ClOH)_4SO_{16}+15H_2O$.——The hexagonal tables of *eisenglimmer* in the sunstone of Tvedestrand, and in the carnallite of Strassfurt are pleochroic, according to Rinne,[17] with $\omega > \epsilon$. The colors are yellow and dark brown.——As the result of several analyses Jannettaz[18] concludes that oriental *turquoise* is colored by phosphate of copper, while the color of the occidental turquoise is of organic origin and due to phosphate of iron (vivianite).——The *titan-olivine* of Damour (from Pfunden, in the Tyrol), thought by Descloizeaux to be orthorhombic, has been examined optically by Lacroix,[19] and found to be monoclinic. Its thin section is pleochroic in yellowish and reddish-yellow tints. It is polysynthetically twinned, and its optical angle $2V=62°\ 18'$. It is, therefore, intermediate in character between olivine and the minerals of the humite group.——At the lower extremities of stalactites of *nesquehonite*[20] pseudomorphs after *lansfordite* from Lansford, Pa., Genth and Penfield[21] have discovered crystallographic planes which enable them to work out very satisfactorily the crystallization of the original mineral, which is found to be triclinic with $a:b:c=.5493:1:.5655$.——The similarity in properties between *agalite* from northern New York and bastite seems to indicate that the former mineral is an altered enstatite.[22]——Gürich[23] has recently published a list of the minerals occurring in the German possessions of Southwestern Africa. The list embraces about fifty-five species, and these are separated into groups, according as they occur

[15] *Amer. Jour. Sci.*, July, 1890, p. 62.

[16] Ib., July, 1890, p. 83.

[17] *Neues Jahrb. f. Min.*, etc., 1890, I., p. 193.

[18] Bull. Soc. Fran. d. Min., 1890, p. 106.

[19] Ib., XIII., 1890, p. 15.

[20] AMERICAN NATURALIST, April, 1889, p. 261.

[21] *Am. Jour. Sci.*, Feb., 1890, p. 128.

[22] Scheibe. *Zeits. d. Deutsch. Geol. Ges.*, 1890, XLI., p. 564.

[23] *Neues Jahrb. f. Min.*, 1890, I., p. 103.

in pegmatite or in quartz veins, in quartz lenses in schists, or imbedded in granite, mica-schist, hornblende rocks, crystallized limestones, or garnetiferous beds.——Oebbecke[24] describes briefly a small crystal of *arsenopyrite* from the granular limestone of Wunsiedel, in the Fichtelgebirge. Its composition is: As = 46.91; S. = 18.64; Fe = 34.31. ——Mr. Diller[25] announces the discovery of native *gold* in calcite from near Minersville, Trinity Co., Cal., and Mr. Hersey[26] mentions the discovery of *arsenic* in nodular masses in a silver and gold mine a few miles west of Leadville, Colorado.——*Magnetite* crystals from serpentine in New Zealand are reported by Prof. Chester[27] to have the composition following:

Fe_2O_3	FeO	Mn_3O_4	MgO	CaO	SiO_2
66.71	19.62	4.63	7.15	tr.	2.38

The silica is supposed to come from particles of silica adhering to the crystals.——Lacroix[28] believes that *carphosiderite* is a much more common mineral than is generally supposed.

Mineral Syntheses.—By an interesting series of experiments, that are in the main but modifications of well-known processes, Weinschenck[29] has prepared metallic sulphides with many of the properties of the natural compounds. By distillation of the oxides with sal-ammoniac and sulphur he obtained crystals of pyrite and of a regular copper sulphide with the composition of chalcocite. By the action of sulphuretted hydrogen under pressure upon the proper salts, galena, argentite, covellite, cinnabar, orpiment, troilite, millerite, and alabandite were produced. Corundum, diaspore, and rhodochrosite were obtained by the action of urea upon suitable compounds in solution. Other experiments afford an insight into the method of formation of the minerals of the apatite group. The paper is a valuable contribution to the study of the genesis of some of the most important of the common minerals.——Messrs. Hautefeuille and Perry[30] have dissolved alumina in nepheline, and have gotten a vitreous paste in which are many hexagonal plates of corundum.——Michel[31] has produced

[24] *Zeits. f. Kryst.*, etc., XVII., 1890, p. 384.

[25] *Am. Jour. Sci.*, Feb., 1890, p. 160.

[26] Ib., p. 161.

[27] *Min. Mag.*, 1889, VIII., p. 125.

[28] Bull. Soc. Franc. d. Min., Jan., 1890, p. 8.

[29] *Zeits. f. Kryst.*, XVII., 1890, p. 486.

[30] Bull. Soc. Franc. d. Min., 1890, XIII., p. 147.

[31] Ib., p. 139.

azurite and gerhardite by allowing a solution of nitrate of copper to act on particles of calcite several years under the ordinary pressure. ——Nepheline, leucite and orthoclase have been obtained by Messrs. C. and G. Friedel[32] upon treating finely-powdered muscovite with alkalies and alkaline silicates in various proportions. With potash containing about two per cent. of soda a portion of the muscovite is dissolved, and prismatic hexagonal crystals of nepheline are yielded. The composition of these shows them to consist of a mixtnre of one part of potash nepheline to two parts of the corresponding sodium compound. When soda is substituted for potash the nepheline crystals produced measure 5—8 mm. in length, and consist of one part potash nepheline to three parts of the sodium compound. When treated with silicate of potash and heated, beautiful crystals of orthoclase are produced. Leucite, together with orthoclase and nepheline, are yielded by a mixture of mica with half its weight of calcined silica and seven-tenths of its weight of potash. The same experimenters[33] produced anorthite by treating mica at 500° with lime in the presence of water. Having obtained sodalite[34] by the action of soda and sodium chloride in mica, they next attempted to make nosean by substituting the sulphate for the chloride in the last experiment, but succeeded[35] only in the production of prismatic negatively uniaxial crystals differing from nosean in containing two molecules of water.——Nitrate of copper heated to 130° in sealed tubes with urea yields[36] a basic nitrate identical with gerhardite.[37]

[32] Ib., p. 129.

[33] Ib., XIII., p. 233.

[34] Ib., XIII., p. 183.

[35] Ib., XIII., p. 238.

[36] Mallard. Ib., p. 67. Cf. Ref. to Michel's Syntheses above.

[37] Wells and Penfield. *Amer. Jour. Sci.*, 1885, XXX., p. 50.

BOTANY.

Notes on Rare East Tennessee Lichens.—Two months of constant work, for which previous experience in Florida had prepared me, have been well rewarded by the securing of two hundred species, many, of course, common. Tennessee has ever been a paradise for the phanerogamic botanist, and justly so; but I venture to affirm that but few have delved very deeply for our humble lichens. And yet the inherent interest attaching to these plants is vastly enhanced by the inspiring associations of locality. Mountain-tops and their craggy sides, rent in places by deep cañons with towering walls on either side, two thousand feet in height, showing different geological strata, and affording a foothold for the holly, birch, and hemlock, present peculiar charms as well as advantages,—for each different stratum or tree may be the favorite substrate required to promote the growth of certain species. I find this fastidiousness as true of lichens as of their more pretentious and showy neighbors in the floral world. Economy of space will confine my notes now to some of those species that are practically rare or unknown in American Herbaria.

Ramalina calicaris, var. *farinacea* Schaer; somewhat abundant on sandstone on Lookout Mountain.

Theloschistes concolor Dicks; on oak and hickory trees; common.

Parmelia ambigua Ach.; on *Pinus mitis*. I omit a dozen other fine species, of which *P. borreri* is best developed.

Physcia ciliaris, var. *crinalis* Schaer; on oaks and Nyssa up to two thousand feet elevation; very fine.

Physcia aquila, var. *detonsa* Tuckerm.; abundant on Quercus on Lookout Mountain, and also on sandstones.

Pyxine sorediata Fr.; very finely fruited; abundant on sandstones, occasional on oaks.

Umbilicaria pennsylvanica Hoffm.; on sandstones; common; most developed at high elevation.

Sticta pulmonaria L.; found only twice,—on oaks along the mountains.

Peltigera canina; abundant in damp, shaded gorges.

Leptogium juniperinum Tuckerm.; exists in rosulate clusters on rocks and on cedar; a subspecies of *L. tremelloides;* Lookout Mountain.

Lecanora affords interesting forms. Among them, *L. cinerea*, *L. badia*, *L. tartarea*, a very elegant species with immense apothecia, in

appearance reminding me of *L. pallescens;* the ever-varying *L. cervina* Nyl.; subspecies *L. privigna*—var., is abundant, and of large size, with remarkable spores; on sandstone; I omit several other species.

Cladonia; of the numerous species I will only cite *C. cæspiticia* Flotow, and *C. turgida* Hoffm., which grow on bare rocks and earth at some elevation.

Passing by Bæomyces I find in Biatora a multitude of species, and mostly on rocks; as *B. rubella* Rabh., in several subspecies; *B. coarctata* Th. Fr., and var.; on trees are *B. russula* Mont., and *B. parvifolia* Pers.

Lecidea enteroleuca Fr., *L. platycarpa* Ach., *L. albocærulescens* Fr., occur on sandstones and chert in puzzling forms; *Buellia* affords interesting species, largely saxicolous; among the latter are *B. colludens* Nyl., *B. petræa*, and var. *albinea*, *B. spuria* Arn.; while the parasitic *B. inquilina* and *B. parmeliarum* occur on the thallus of other species.

Lecanactis premnea; on bark.

Platygrapha periclea Tuckerm.; found only on hemlock in mountain gorges, but associated with it are *Pyrenula thelæna*, and a very interesting Biatora near *effusa*.

Sagedia cestrensis and *S. oxyspora* on Ostrya and Betula.

Verrucaria pyrenophora is abundant on limestone.

These are only a few species identified from a practically unexplored mass of material. My thanks are due to my friend, S. Higginson, Esq., for assistance, while my Rabenhorst and Lojka specimens have enabled me to make good comparisons, especially in rock forms.—W. W. CALKINS, *Chicago.*

Botany in the British Museum.—The recent report of the Curator of Botany in the British Museum contains a number of interesting matters. It appears that during the year 51,652 specimens were "mounted, named, and inserted in their places in the herbarium." These accessions came from many parts of the world,—Europe, China, Japan, Borneo, Africa, Australia, Canada, Mexico, and South America. It is consoling to American botanists to read that "the exhibited series of British plants has been completed as far as the vascular plants are concerned, every species recognized by Bentham in his 'British Flora,' being placed in the case, with its description from that work." If the complete exhibition of the British flora has just been achieved in so richly endowed an institution, we need not consider ourselves unduly delinquent in this country, where the local floras are so poorly represented in herbaria.

A thorough revision and rearrangement of the natural orders has made some progress, already including the Gramineæ, Compositæ, Caryophyllaceæ, Cupuliferæ, Filices, and several others. During the year the collection of microscopic preparations, numbering 4,429 specimens, made by Professor DeBary, was acquired by purchase. Many valuable collections of varying sizes were presented, and as many more were purchased.—CHARLES E. BESSEY.

The Word "Herbarium."—A writer in the *Pharmaceutical Journal*, Mr. G. C. Druce (quoted in the September *Journal of Botany*), says: "The origin of the word herbarium, as applied to a dried collection, is by no means certain. It is true we frequently meet with the name in the older writers, but to them it meant a book about plants, and generally an illustrated book." He then, after a general discussion, describes an old parcel of plants at Oxford which he examined recently. The specimens were in a good state of preservation, and proved to have been prepared by one Gregory of Reggio in the year 1606. This collection was labeled on the back "Herbarum Diversarum Naturalium." This the writer thinks is the earliest use of the word in this sense. Gregory of Reggio "was noted for his botanical knowledge."

The Microspores of Sphagnum.—In a preliminary communication in a recent number of the *Botanisches Centralblatt*, S. Nawaschin, of Moscow, attempts to answer the question as to the nature of the so-called "microspores" of Sphagnum. Having good material of *S. squarrosum* in various stages of development, he found that the microspores appear to develop from fungus-hyphæ, instead of from the well-known spore-mother-cells of the Bryophyta. Fungus-hyphæ were found in other portions of the Sphagnum plant-body, also adding to the probability of the fungus nature of the microspores. The investigator ventures the surmise that these puzzling spores are not Sphagnum spores at all, but those of Ustilagineæ, of the genus Tilletia. To it he gives the provisional name of *T. sphagni*.

The Species of Cotton.—Schumann, in his elaboration of the Malvaceæ for Engler and Prantl's "Natürlichen Pflanzenfamilien," recognizes three species of Gossypium (cotton), viz.:

G. barbadense L., with the "cotton" easily separated from the seeds, which are then naked.

G. arboreum L., "cotton" separated with difficulty, seeds with a persistent coat of short filaments, leaf-points oblong, flower purple-red.

G. herbaceum L., with "cotton" and seeds as in the last, leaf-points broad-ovate, flower yellow.

The first is a native of America, and is known as "sea-island cotton," "Barbadoes cotton," or "New Orleans cotton." The cotton of Peru is considered to be a variety of this species.

The second species has long been grown in Egypt, Arabia, and India, and produces an especially white cotton.

The third species is the one now so extensively grown in the Southern States, to which it was introduced from India a little more than a hundred years ago. During its long cultivation (more than 2600 years) it has given rise to a number of marked varieties, of which var. *religiosum* L., with yellow cotton, is known as "Nankeen cotton."

Fertilization of the Grape. — Dr. M. Kronfeld states that although the cultivated grape-vine is usually anemophilous, yet that, under certain conditions, it is fertilized by honey bees, especially when there is in the same neighborhood an abundance of other plants which are visited by bees (*Jour. Roy. Micros. Socy.* for August).

Another "Ism" in Botany.—A new word has been invented by Dr. Clos, to be applied to the dwarf-condition of plants. He calls it "nanism."

The Annals of Botany.—Number 13 of this excellent botanical periodical contains the following papers:

A monograph of the British Gastromycetes, by George Massee.

On a change of flowers to tubers in *Nymphæa lotus* var. *monstrosa*, by C. A. Barber.

On the change of shape exhibited by turgescent pith in water, by Anna Bateson.

Observations on the structure of the nuclei in *Peronospora parasitica* during the formation of the oospore, by Harold W. T. Wager.

On some recent progress in our knowledge of the anatomy of plants, by D. H. Scott.

The "Notes" are: A new application of photography to the demonstration of certain physiological processes in plants; double-flowered Ceanothus; on Dr. Macfarlane's observations on pitchered insectivorous plants; attempts to induce aposporous developments in ferns; a lily disease in Bermuda; the onion disease in Bermuda; a hybrid desmid; Vaucheria-galls; the stomata in the fruit of *Iris pseudacorus* Linn.; *Mystropetalon thomii* Harv.

In number 14 the leading papers are the following:

Monograph of the Lemnaceæ of the United States, by George F. Atkinson.

The mucilage- and other glands of Plumbagineæ, by John Wilson.

Note on the fertilization of Musa, *Strelitzia reginæ*, and *Ravenala madagascariensis*, by G. F. Scott-Elliot.

Ornithophilous flowers in South Africa, by G. F. Scott-Elliot.

Notes on *Chondrioderma difforme*, and other Mycetozoa, by Arthur Lister.

The "Notes" are: On cortical fibro-vascular bundles in some species of Lecythideæ and Barringtonieæ; Vaucheria-galls.

A New Work on "Plant Morphology."—Plant morphology has not in general been of such a nature as to commend it to the more critical of our scientific men. It has been too largely a merely technical discussion of those external structures which can be made use of in classification. So great has been the abuse of the term that many of the botanists of the new school refrain from using it lest they be misunderstood. What the study of the skins in the old-fashioned museums was to zoology, that the so-called "morphology" of the common botanical books has too largely been. The student of animals has long since discarded such a profitless labor, and has substituted the careful study of structural homologies based upon similarity of development. Animal morphology to-day occupies the greater part of the attention of zoologists, while comparatively little time is given to the study of purely external and superficial characters. In this way zoology has become much more philosophical than its sister science, botany.

A new work on the general morphology of plants ("Allgemeine Morphologie der Pflanzen"), by Dr. Ferdinand Pax, is written upon a somewhat higher plane than most of its predecessors, and will doubtless prove a good example to our text-book makers. It is divided into two principal parts, the one treating of the Morphology of the Vegetative Organs, and the other of the Morphology of the Reproductive Organs. The vegetative organs are included under "root" and "shoot," each of which is then discussed under several heads. The shoot is treated as follows: (I.) The structure of shoots and the shoot-system; (II.) biology of shoots; (III.) plasticity of shoots; (IV.) the life-history of the shoot; (V.) leaf-sequence in the shoot; (VI.) the leaf. The root is treated similarly, but at less length. In the treatment of the second part of the work, that relating to the reproductive

organs, there is less departure from the ordinary methods. There is a discussion, much after the usual fashion, of the "morphology" of the flower-cluster, and the flower, and in this the student will receive few if any new ideas. In the discussion of reproduction proper there is again much more that is modern and instructive. Thus we have:

(I.)—Non-sexual reproduction.
(II.)—Sexual reproduction.
1.—Sexual reproduction of the Cryptogams.
2.—Sexual reproduction of the Phanerogams.
3.—Relation of sexual to non-sexual reproduction.

An interesting section is devoted to the phylogenetic development of the flower. The "flower" is very properly regarded as an evolution from modifications of the plant-body found in the Pteridophytes. The spore-bearing cone of Selaginella is "the prototype of an hermaphrodite naked flower," between which there is often a marked external resemblance.—CHARLES E. BESSEY.

ZOOLOGY.

A New Phoronis.—Dr. E. B. Andrews has found a new species of the remarkable genus Phoronis at Beaufort, N. C. It lives in isolated chitin-like tubes placed upright in the sand. The species has the greatest affinity with *Ph. kowalevskii* in the arrangement of its sixty tentacles, but it is remarkable for the presence of spoon-shaped glandular organs at either end of the lophophore. The function of these organs is unknown, but it is suggested that they may have some connection with the tube-building habit. The alimentary canal consists of two stomachs and an intestine. In the first stomach there is a longitudinal ridge of ciliated gland-cells, recalling that of Sipunculus. There is also a peculiar intracellular digestion in the first stomach. Apparently the sexes are separate. The left nerve-rod only has an extensive development. Dr. Andrews thinks that this species, which he has named *Ph. architecta*,[1] approaches nearer to the Sipunculid than to the Polyzoan type.

[1] *Ann. and Mag. Nat. Hist.*, June, 1890.

The Arthropod Eye.—Dr. Patten,[2] from a study of the eyes in several hexapods, concludes that "the convex eye of arthropods is a group of hair-bearing sense buds." New facts are presented regarding the eyes of Belostoma, Tabanus, and Vespa, and the following additional conclusions are drawn: The so-called pseudocone is the homologue of cuticular sense hairs; between the ommatidia occur hair-cells, which are surrounded by pigment, "so that they bore a very striking resemblance to ommatidia, and probably functioned as such." As a corollary the pseudocone type is the most primitive. Watase's view is regarded in this light as erroneous, the development of Vespa showing that there is no bending of the retinula cells. Patten thinks that a "telescoping" rather than an invagination must be invoked to explain the features of the arthropod eye. Corrections are made of former statements as to the relationships of the corneagen cells to the spindle (rhabdom), and the formation of the corneagen in Vespa.

Molluscan Notes.—Canon A. M. Norman, the English student of the invertebrata, has begun in the *Annals and Magazine of Natural History* a revision of the British mollusca.

It may interest conchologists to learn that the somewhat rare mollusc *Zirfæa crispata* occurs abundantly at Salem, Mass., at a spot where it is easily accessible at low tide. The locality is in a bed of indurated clay, about midway between the "neck" and the beacon on the neck bar. At low tide they are covered by but two or three inches of water.

The Origin of Vertebrates.—Two recent papers attempt to find the ancestors of the vertebrates in the arthropods. The first, by Dr. William Patten,[3] recognizes this ancestor in the arachnids. The nervous system is compared throughout with that of vertebrates, and some startling homologies are brought out, embracing not only general relationships but exact correspondences in minute details of sense organs, segments, nerves, etc. The vertebrate mouth arises as a modification of the dorsal organ, the notochord from the the mittelstrang of the arthropod nervous system, the cranium from the entosternite, the gill slits from nephridia; the pectoral fins are homologous with the scorpion pectines! Aside from these speculations the paper contains a number of observations on the embryology of scorpions and of Limulus.

[2] *Anat. Anzeiger*, V., p. 353, 1890.

[3] *Quar. Jour. Micros. Sci.*, XXXI., p. 317, 1890.

The second paper, by Dr. W. H. Gaskell,[4] is fairly appalling. In two former papers[5] we had been favored with a foretaste of this wonderful production, but here it appears in detail so far as the first chapter is concerned. Space will permit but a mere outline. Like Dr. Patten, he seeks the ancestor of the vertebrates in the arthropods, but there all unity ceases. The crustacean nervous system has grown around the alimentary canal, the latter producing the ventricles of the brain and the central canal of the spinal cord. The crustacean gill-bearing legs have been infolded, and give rise to the vertebrate gill-arches, while from the cavity thus formed the vertebrate alimentary canal has grown backward. The pituitary body is the green gland.

Amphioxus in Tampa Bay.—Since some recent attempts to obtain Amphioxus in Chesapeake Bay have been unsuccessful, and since there is considerable difficulty in securing it from other known stations, as Beaufort, N. C., the Bermudas, the West Indies, etc., it may be of interest to know that specimens were abundant and easily secured at Port Tampa, Fla., in March last. The "Port" is eight miles from the city of Tampa, and consists of a railroad trestle-work running out nearly a mile over the shallow water to the wharf where the Havana steamers land. Working from a boat, with only a dip-net, in water from four to six feet deep, some specimens could be obtained with every dip. They were upon the surface of the clean sand. The ground worked over was southward from the wharf, and extended about a mile along the margin of the ship-channel, which is marked by buoys. The location is so far from shore, and so far from disturb ing agencies, that it might be expected to yield a constant supply. A light dredge, with fine-meshed bag, would be the most efficient collecting instrument. The specimens were from one to two inches in length.—ALBERT A. WRIGHT.

[4] *Quar. Jour. Micros. Sci.*, XXXI., p. 379, 1890.

[5] *Jour. Physiol.*, X.; *Brain*, XII., 1890.

PHYSIOLOGY.

Temperature in Nerves.—Rolleston,[1] by using an electrical resistance thermometer sufficiently delicate to appreciate one five-thousandth of a degree, finds, like other investigators, no evidence of the evolution of any heat from the nerve during the passage of a nervous impulse. In dying a nerve evolves heat, in some cases one-seventh of a degree C. The frog's sciatic was chiefly used.

Neurokeratin.—This substance, characterized by extreme insolubility, was discovered by Ewald and Kühne, in 1877, in medullated nerves and the central nerve substance. Kühne and Chittenden[2] have subjected it to a careful study. The nerve tissue was freed from the myelines by prolonged treatment with alcohol and ether; from all digestible matters by gastric and pancreatic juices; and from nuclein by extraction with alkali. Analyses of neurokeratin thus obtained from human brains gave C 56.11 to 58.45, H 7.26 to 8.02, N 11.46 to 14.32, S 1.63 to 2.24. Noticeable are the absence of P and the low amount of S. C is somewhat higher and N somewhat lower than in albuminous bodies. Ordinary keratin from rabbit's hair gave C 49.45, H 6.52, N 16.81, S 4.02, in which S is double its quantity in neurokeratin. The nerve cord of the lobster, treated in a similar manner, yielded a residue of chitin with no neurokeratin. Quantitative determinations in man gave for peripheral nerves .316 per cent., for cortex of cerebellum .312 per cent., for cortex of cerebrum .327 per cent., and for white substance of the corpus callosum 2.902 per cent. The results indicate for myeline-free, dry nerve substance, 1.91 per cent. of neurokeratin; do. gray substance, 3.22 per cent.; do. white substance, 33.77 per cent. Methods are given by the authors whereby this substance may be detected in nerve fibres.

Sensitiveness of Joints.—In studying the muscle sense Goldscheider hypothecates for the joints the two functions of mediating sensations of movement and sensations of resistance. For the former the sensitive substratum is to be found doubtless in the nerves and nerve endings of the capsule of the joint, these being stimulated by the working of the joint. For the latter the question arises whether in the hard surfaces the supposed sensitiveness really exists. He tests this[3]

[1] *Journal of Physiology*, Vol. XI., 1890, p. 208.

[2] *Zeitschrift f. Biologie*, Bd. XXVI.; also *N. Y. Medical Journal*, 1890.

[3] Verhandlungen d. Berl. Physiol. Gesellschaft; in Du Bois Reymond's Archiv, 1890, p. 380.

in the rabbit by touching, pressing upon, stroking, and heating points in the exposed articular surfaces of the tibia and metatarsus, and the deep-lying portions of the bones. Sensations indicated by respiratory reflexes were readily called out. The sensitiveness seems to lie not so much in the surface of the joint as in the layers beneath. No reaction was obtained from the hard bone itself, but the marrow was especially sensitive.

On the Self-Regulation of Respiration.—The effect of the stimulation of the central end of the vagus on respiration has been studied long and carefully, and with varying results. Meltzer finds[4] that weak and medium-strong currents have different effects in different individuals; while strong currents produce always the same effects, viz., inhibition of inspiration, followed soon by an inspiratory after-effect. There must then be fibres in the vagus that produce inhibition of inspiration. In some individuals medium and weak stimuli produce inspiratory effects; hence there must also be, in such individuals at least, fibres in the vagus that bring about inspiration. These may be likened to the accelerators of the heart, while the others act like the inhibitors of that organ. We may then conceive of the vagus as consisting of two kinds of fibres, one producing inspiration, the other inhibiting it. When the cardiac inhibitors and accelerators are stimulated together, the effect of the former alone is observed during stimulation; but after the latter has ceased the short after-effect of the inhibitor fibres is followed by the larger after-effect of the accelerator fibres. In like manner, as regards respiration, we may say that the nerve fibres that inhibit inspiration have but a brief after-effect, while those that cause it have a more prolonged influence. It has been shown that expansion by the lungs has the same effect on respiration as a strong stimulation of the vagus, producing first inhibitory and then inspiratory after-effects. Hering and Breuer formulated a now well-known theory of the self-regulation of respiration, the main principles of which are that expansion of the lung produces an inhibition of inspiration, while collapse produces a following inspiration. Meltzer claims that the latter part of this theory is not supported by facts, and substitutes a new theory based on the above conclusions, viz., the existence in the vagus of two kinds of fibres, namely, inspiratory and inspiration-inhibiting. "Inspiration expands the lung, thereby stimulating both the inspiratory and the inspiration-inhibiting nerve fibres. But during stimulation, and for a very short time after cessation of the expansion, the inhibiting

[4] *N. Y. Medical Journal*, Jan., 1890.

effects alone are manifested, thereby inspiration is interrupted, and an expiration, a collapse of the lungs, follows. But since, with the cessation of pulmonary expansion, the given stimulus disappears, and the after-effect of the inhibiting fibres is of but short duration, the latent inspiratory impulses prevail, owing to their long after-effect, and cause an inspiration. This again establishes an expansion of the lung, and thereby an expiration, etc."—L. G.

ENTOMOLOGY.[1]

An Outlet for Memoirs, Monographs, and Faunal Lists.[2]—As a rule the opportunities for publication of the experiment station entomologists are limited to station bulletins, and entomological or general natural history journals. The former, with rare exceptions, are only available for the publication of investigations having an immediate practical import, and the latter can only be satisfactorily used for articles of moderate length. It is true that to a certain extent monographs and revisions can be published in the Transactions of the American Entomological Society and the publications of the National Museum, but these channels are not open to all, and as a rule are reserved for monographic works relating to our fauna as a whole, rather than that of any particular locality.

If the biological work of the experiment stations is established on a broad and comprehensive basis many results will be obtained that are not of immediate interest to the farming community, and which could not be published, except in a fragmentary way, in the existing journals. Among such results the following general classes may be mentioned:

(1) Bibliographical matter, including bibliographies of the insects affecting certain plants, bibliographies of certain groups, faunal bibliographies, etc.

(2) Catalogues, descriptive and annotated, of the organisms of a locality, county, or state.

(3) Memoirs on the biology of certain groups, the insects relating to certain plants, or the relations of various organisms or groups of organisms to each other and to their environment.

[1] Edited by Dr. C. M. Weed, Experiment Station, Columbus, O.

[2] Prepared for Entomological Section, American Association of Agricultural Colleges and Experiment Stations, November, 1890.

(4) Monographic works.

It seems to me that there is a decided need of an outlet for these classes of results, and I have heard others among us express a similar sentiment. On this account I venture to bring the matter before you, in the hope that it will be fully discussed, and, if it seems desirable, some plan of action decided upon.

I anticipate that one of the first objections that will be raised is that it is difficult for existing entomological journals to find matter with which to fill their pages. If this is true, and to a certain extent no doubt it is, it ought not to be much longer, for when the entomologists of the stations get well established they should turn out an amount of work that will more than fill these journals with the short contributions for which they are especially fitted. But the suggested publication is not intended for this kind of matter, and ought to increase rather than decrease the number of contributions to existing journals.

It seems as though some coöperative plan might be carried out by which the opportunities for publication of the results of biological investigation would be greatly increased,—a fact which would also greatly stimulate the prosecution of such investigations.

Among the points that to my mind appear to be desirable to keep in view in carrying out such a project are the following:

(1) To exclude short papers that can easily go in existing journals.

(2) To make little or no attempt at reviews, notices of current events, editorial remarks, etc., reserving the pages entirely for contributed articles.

(3) To place the management in the hands of an editoral committee, by whom the acceptance or refusal of articles submitted for publication should be decided.

(4) To include papers in other departments of zoology, rather than to make it exclusively entomological.

(5) To issue it only as material accumulates, and, for the present at least, not oftener than quarterly.—CLARENCE M. WEED.

The Apple Maggot.—Professor F. L. Harvey, of the Maine State College, has lately published an elaborate article containing the results of investigations made during 1888-89 upon the Apple Maggot (*Trypeta pomonella* Walsh). It consists, as the title-page states, of "a consideration of the literature, history, transformations, life-history, and habits of this insect, also remedies;" and forms by far the best account of the species that has been published.

Professor Harvey has investigated the subject *de novo*, and besides adding a number of new facts to our knowledge of the insect, has corrected several points in its currently accepted life-history. In Maine the flies appear about July 1st, continuing to emerge all summer, and being found in abundance until October. Each female fly is capable of laying at least three or four hundred eggs, which are inserted from time to time, one in a place, by means of a sharp ovipositor through the skin of the apple. The full-grown larvæ leave the fruit after it falls, and pupate at or near the soil surface. The winter is passed in the pupa state, the flies appearing the following summer. The destruction of windfalls is considered the most promising remedial measure. Preventing the importation of infected fruit from other States by law is strongly recommended. The article closes with a critical review of the literature of the species, which leads to this pertinent paragraph: "The above review also suggests the importance of careful work on the part of entomologists that their writings be as free as possible from errors, and that great care should be taken, especially in quotations, to keep theories and surmises distinct from facts obtained by careful research."

The investigations thus recorded were evidently made as a part of the work of the Maine State College Experiment Station, but there is nothing upon the copy at hand to indicate when, where, or by whom it was published.[3]

American Frit Fly.—Professor H. Garman, of the Kentucky Experiment Station, in a recent bulletin (No. 30), describes the life-history of a new wheat fly, supposed to be *Oscinis variabilis* Loew, for which the above name is proposed, on account of its similarity to the European frit fly (*Oscinis frit* L.). The insect has been found infesting grain in Fayette county, Ky., although but little damage has yet been done. Careful descriptions, accompanied by good figures, of the larva, puparium, and adult are given. The destruction of volunteer grain and late planting are the preventive measures suggested.

The Genus Agrotis.—Bulletin No. 38 of the U. S. National Museum consists of a revision of the North American species of the genus Agrotis by Prof. J. B. Smith. Lepidopterists are to be congratulated upon the publication of this paper, for it treats in a clear and systematic way of a group which, as the author well says, was simply "a huge assemblage of species, through which no path was

[3] Since this was written we have learned that the memoir forms a part of the Maine Experiment Station Report for 1889.

visible, and in which identification to any but the specialist, or to one with a large collection, was all but impossible." Professor Smith has greatly restricted the genus Agrotis, leaving but eight species in it, and has proposed for the others a number of new genera, based on definite structural characters. He has also used seven existing generic names. The revision is based on a study of nearly all the important collections of the country, and covers nearly 250 pages.

In the introductory paragraphs we find this significant remark: "I had at one time the strong conviction that genera were natural assemblages, capable of strict limitation and definite in extent. The study of very large material since that time has convinced me that my first impression was erroneous, and that genera as such are mere artificial divisions of convenience, useful for the purpose of identification, and for the expression of relationship, and that they were useful for that purpose just in proportion as they expressed clear and definite associations of characters."

The White Grub.—In the June (1890) Crop Report of the Illinois State Board of Agriculture Prof. S. A. Forbes reports having demonstrated that "the current life-history of our common white grub is mistaken. All our most abundant species complete their growth as grubs in midsummer or early autumn, and form both pupa and adult beetles the same season, hibernating in the earth in this last stage, and coming out in May or June of the next year. Where these grubs are injurious in the fall they may be expected, as a rule, to be even more destructive in the same fields the following spring."

Professor Forbes also announces having obtained evidence that there may be four generations of the Hessian fly, which attack wheat with destructive effect,—two in spring and two in autumn.

Nematodes in Australia.—The August issue of the *Agricultural Gazette*, of New South Wales, is devoted to a discussion of Nematode injury to root crops by Professor N. A. Cobb. It is divided into three sections,—the first treating of the life-history of *Tylenchus arenarius;* the second describing twenty-four species of the genus Tylenchus, with which the author unites Heterodera; and the third discussing the disease and its remedies. This paper will be of great value to all engaged in studying these little creatures.

Miss Ormerod's Manual.—A new and greatly-enlarged edition of Miss Eleanor A. Ormerod's admirable Manual of Injurious Insects has lately been published. The new work forms a volume of over four hundred pages, the mechanical execution of which is altogether

excellent. The main portion of the book is divided into three parts, treating of the insects affecting food crops, forest trees, and fruit crops, respectively. To this is appended a list of the insects discussed, an introduction to entomology, and a glossary of entomological terms. Much has been added, in the author's usual careful and thorough-going style, to the accounts of the first edition, published in 1881. The work will doubtless prove of great value to British agriculturists, and Miss Ormerod is to be congratulated upon its appearance.—C. M. W.

Beetle Parasites.—The braconid parasite of *Lixus concavus*, mentioned on page 972 of last month's NATURALIST, has been identified by Dr. C. V. Riley as *Bracon rugator* Say. I am also indebted to the same authority for determining the parasite of *Tyloderma foveolatum*, mentioned in the same connection, as *Bracon xanthostigma* Cresson.—C. M. W.

ARCHÆOLOGY AND ETHNOLOGY.

Rigveda Studies.—Sanscrit students who have had an insight into Vedic studies know perfectly well that we are only at the beginning as far as a real comprehension of the Rigveda is concerned. In recent years many ripe scholars have striven to render this work more accessible. The joint work of two Halle professors, R. Pischel and K. F. Geldner, entitled "Vedische Studien," marks a great advance in this direction,[1] and intends to refute many erroneous ideas still adhered to concerning that oldest Aryan monument. The treatment of the mythologic element was undertaken by Pischel, whereas linguistics and text-criticism fell to the share of his collaborator.

Both are of the opinion that it is entirely wrong to consider the period when the Vedas, especially the Rigveda, took their origin as a pastoral or nomadic one, undefiled by the civilization or corruption which are characteristic of later historical epochs. The people were then as eager to acquire worldly goods as they ever were in the time of the classical epics called Maha-Bhârata and Ramâyana. They prized artistic ornaments and fine dwellings, knew the art of writing, and were acquainted with the use of salt. The mention of village communities and of walled towns or cities proves that the nomadic

[1] Vedische Studien von Richard Pischel und Karl F. Geldner. I. Bd., Stuttgart, Kohlhammer, 1889, 8vo, 33 and 328 pages.

period had come to an end long before. The wide diffusion of the custom of hetairism could prove by itself alone that the Vedic hymns, in which it is mentioned, are of a relatively late period.

Though the volume is mainly addressed to critical and philological specialists, many points in Pischel's remarks will be of use to every one interested in literary history,—the following for instance:

No one, says he, should start out upon Vedic studies before having laid a firm foundation for these by the perusal of the classical masterpieces, and for a better understanding of the Veda even Pâli and Prâkrit are indispensable. Mythologic comparisons taken from non-Aryan or from other Aryan nations are of very limited use, on account of the difference in time, manners, and ideas. They are likely to lead to very erroneous conclusions. The old Aryan religion, representing powers of nature and centering in Varuna, was on the wane in the Rigveda period; Sûrya, Parjânya, are still in vogue, but a new and purely national religion, with Indra as its central figure, was just coming into ascendency, and even then was more popular, because more thoroughly national and Hindooic, than the Varuna deities. Therefore we cannot expect to find in every god, myth, or folk-tale in the Rigveda a reminiscence of some Aryan god or idea, but have to compare as well the myths of modern India for their Indra folk-lore. Here the natural powers have given way entirely to human feelings and popular humor. The Agni and Soma hymns, with their stiff, mystic, formal, and priestly poetry, are generally superseded by the Indra hymns, with their lively imagination and humoristic vein.—A. S. G.

Schliemann's Ilion.—Those who suppose that the modern Trojan war—that is, the fiery contest between Schliemann and Captain Boetticher—has come to an end are entirely mistaken. Hector-Schliemann is defending his Pergamos as valiantly as ever, though Achilles-Boetticher is invoking all the help he can get from the gods to storm the citadel. In 1889 Schliemann invited Boetticher, with Virchow, Dörpfeld, and other competent men to visit the place personally, and the ruins were viewed on the spot. The report made on Schliemann's side claimed that at the time all difficulties had been settled, for Boetticher had declared that mistakes had been made on his part. Boetticher claims that the ruins, with the seven "cities" superposed to each other, were not cities, but huge cremation places surrounded by walls. Schliemann and Dörpfeld believe that only the third "city" (counted from below) was a crematory with urns. Boetticher believes that the huge *pithoi* or vats of pottery, often twelve feet high, were used for slow cremation of whole bodies of persons.

This Prof. Virchow denies, for notwithstanding the porosity of such vases, it was impossible to establish a draft sufficient for cremation. The most convincing argument of Boetticher for his theory is the smallness of the ruins, for they measure only one hundred and forty metres in length, and about ninety-three metres across,—a space upon which it was impossible to build a city one-tenth the magnitude of Homer's Troy. Boetticher has also demonstrated that at Hissarlik, where the ruins are, no hill ever existed before the first necropolis had gone there into ruins and began to form the mound now in existence. He locates the true city of Ilios upon the heights between Hissarlik and the Rhoeteion, a hill on the southern shore of the Dardanelles.

Before us is a series of five *missives* published by Boetticher after the return from Hissarlik, two of which are illustrated and quite voluminous (one being in French). The author claims to have been unfairly treated at that interview,—that the time set was too short for the purpose, and that he was not allowed to speak freely. So he maintains his former position firmly, and vigorously asserts his claim that the ruins in question are nothing but a necropolis to incinerate bodies after the Assyro-Babylonian fashion. Among the scientists who have given their assent to Boetticher's idea may be named Prof. Moritz Wagner, of Munich; Georg Ebers, of Leipzig; and C. de Harlez, of Louvain. This is said to those readers who rely upon scientific authorities.—A. S. GATSCHET.

Additional Studies of Zuni Songs and Rituals with the Phonograph.—I have already, in a previous number of the NATURALIST, mentioned some of the records of Zuñi songs and rituals which were obtained during the last summer by means of the phonograph. Since the preparation of that paper I have been able to obtain several important additional records, and to revise some of those which were mentioned in my previous notice. Some of these are so important that a mention of them may interest those who are in sympathy with this method of research.

The difficulties in the transportation of the phonograph from the railroad to Zuñi are not as great as might be imagined. Although the trail from Gallup, New Mexico, to Zuñi Pueblo is in places very rough, the instrument suffered no damage from transportation. I found it convenient, however, to take with me the treadle machine, which is more practical for this kind of work than that furnished with the storage battery. The former is, moreover, more bulky, and on that account more difficult to carry over rough roads.

I have been repeatedly asked since my return, "What the Indians

thought of the phonograph?" That question can only be in part answered. What they really thought is unknown to me, but some of their remarks about it were rather interesting. Some of those who gave me songs declared that there was a person hidden in the machine who repeated what they sang; others said that the machine was bewitched. But not one of those whom I asked, except some squaws, seemed afraid of the instrument, or if they were afraid did not manifest it in any way. A Laguna Indian, who was a visitor in Zuñi at the time of my visit, philosophically remarked, as translated for me, that the white men used many machines which he did not understand, and as he knew these were not bewitched there was no reason to suppose that the phonograph was possessed of any such powers. I cannot, however, but think that all who saw the instrument mentally reiterated what the Zuñi silversmith, Kuishte, said to me in Spanish (perhaps not the purest Castalian), "*Melicano sabe mucho.*" I permitted them to hear the records which they had given, and in every case to my question whether the record was accurate or not they responded with that universal Zuñi word to which so many different shades of meaning are given by inflection, *kokshi*, good.

It was my good fortune to witness in Zuñi, in August of the present year, an ancient dance of interesting character. This ceremonial is a corn dance, and is known among the Zuñians as the *Otonarweh*. The ancient name is *Hamponey*. This dance is rarely performed, and has seldom been witnessed by white men, as it occurs only after intervals of several years. The *Hamponey* is reputed by all to be most ancient, and there are many ceremonies in it which indicate its antiquity. It was therefore with great interest that I made elaborate notes upon it, and sought particularly to obtain records of its songs on the cylinders of the phonograph for preservation. Through the kindness of one of the Indians, who occupied an important office in the ceremony, I was reasonably successful with the latter. When one considers the changes which yearly come to the Indians, and the probability that in a few years many of their customs will be greatly modified or disappear forever, the necessity for immediate preservation of their songs and rituals is imperative. In the case of the *Hamponey*, which is celebrated only once in from five to eight years, the necessity of preservation by observers is increased in proportion to the rarity of its occurrence. Eight years in the life of a New Mexican Pueblo may profoundly affect its whole social and religious characters; and when once lost these religious rites and ceremonials, which are survivals of the ancient indigenous culture of the southwestern territories of the United States, are lost forever.

It is my purpose later to publish an elaborate paper on the *Hamponey*, in which will be embodied the songs, set to music, which were obtained by the use of the phonograph, so that it is not necessary to do more in this account than to say that the ceremony is a corn dance performed by women, and somewhat similar to a dance called the *Klăheywey*, yearly celebrated by them. It is a "tablet dance," in which corn is carried in the hands, and takes place just before the harvest. The dance continues for a whole day and night in the open plaza, and most of the ceremonials can be seen by all.[1]

Not far from the site of an old Pueblo of the Zuñi valley, called Halonawan, the "Ant Hill," on the opposite side of the Rio Zuñi from Shewena, the present Pueblo of Zuñi, there is a small shrine known as Herpăhtenăh. This is a very sacred place to the Zuñians, and very interesting ceremonies are performed about it. At the close of the *Hamponey* a solemn procession of participants in the ceremonies of the dance makes a pilgrimage to it. They place in its interior the offerings of prayer plumes, sacred meal and water used in the dance. While I have reserved a description of what takes place at Herpătenăh for another place, a notice of it finds an appropriate place here in connection with my phonographic work on the songs and prayers of the *Hamponey*.

Travellers on the Atlantic and Pacific Railroad may have noticed the splendid flow of lava or "*malpais*" near the road at McCarty and Grant Stations. The appearance of this lava is so fresh that one might say that it was viscid but a few years ago. In places it looks not less ancient than some of the historic lava flows on the sides of Vesuvius. It is reported on good evidence that at certain points along the edge of this flow there are artificial structures, partially covered by this lava. The existence of these would be good evidences of its age as compared with the existence of man in the neighborhood. As additional evidence bearing on this point I have brought to light an old Acoma folk-tale which accounts for its origin. I owe my knowledge of the existence of this tale to Capt. Pradt, of Laguna.

According to this legend an old gambler challenged the sun to play with him. This challenge the sun at first refused to accept, but being taunted with cowardice he played with his challenger, won all that he had, and made him blind. The blind man was in turn taunted by his fellows, and to revenge himself sought the help of a powerful person, who caused the earth-pitch (lava) to rise out of the earth and destroy men and their dwellings. The whole human race, the story goes, would have been destroyed if the snow-birds had not collected together

[1] Mexicans are not allowed to witness any of the sacred dances of the Zuñians.

to aid it, and brought with them [2] the snow which cooled off the liquid lava, and hardened it into stone.

Although summer months are not the best in which to obtain folk-tales from the Zuñians, and from some, if not all, of the other Pueblo Indians, I was fortunate enough to get on the phonograph the story of the origin of the lava flow from a Laguna Indian in his own words. Outside of its value as an account of the origin of this stream of lava, it is also interesting as a record—I belive the first on a phonograph—of a specimen of the Queres language, which is spoken by more Pueblo Indians than any of the several linguistic branches characteristic of the sedentary Indians of New Mexico.

Not the least important of the phonographic records which were taken are several prayers used by hunters to their fetishes, and that of a member of the Pitslashewāne, or "Priests of the Bow," used formerly in the wars with their foes, the Navajos. All of these, which form an interesting collection, are reputed to be very old. As their use is undoubtedly dying out, as game decreases and probabilities of war diminish, a permanent phonographic record of these, most of which have been faithfully recorded by phonetic methods, and translated by Cushing in his most interesting paper on Zuñi Fetishes, is an important addition to my collection.

In my previous paper I have stated that I was able to obtain a phonographic record of the Kaklan, or so-called Zuñi epic, a ritual which narrates the history of the Zuñi race. This important and valuable unwritten record of the past of the nation *I was not able to obtain*. When my former paper was written I thought I had obtained it, but I have since detected my error. After the paper was written, when I found that I had been mistaken, I tried in every way to get this ritual in the language of the priest who recites it, but always to be put off with other things, and at last to be refused. There is certainly no more valuable acquisition to be made in a linguistic study of the Zuñi language than to persuade the Indians to entrust this account of their history to the phonograph, but I must confess my failure as yet to bring it about.

The almost illimitable field for research on the languages of our aborigines which presents itself to the student demands more workers. Now is the time to collect material before all is lost. The phonetic

[2] In Pueblo conceptions the frog brings the rain, the butterfly the summer, and the snow-bird the snow. Causes and effects are singularly confounded, and innumerable instances where animals cause atmospheric and climatic conditions in the same way that the snow-birds brought the cold might be mentioned.

methods now in use are good, but phonograph records are easier to make and more satisfactory. While the collection of many cylinders on which the language, songs, and similar records are made is only a means to an end, it is a practical and efficient way for immediate preservation. The scientific study of these records comes later, but now is the time for collection of them. Edison has given us an instrument by which our fast-fading aboriginal languages can be rescued from oblivion, and it seems to me that posterity will thank us if we use it to hand down to future students of Indian languages this additional help in their researches.—J. WALTER FEWKES, *Boston, October 4, 1890.*

The Aryan Cradle-Land.—"It will be for the benefit of our science," said the president of the Anthropological Section of the British Association, "that speculations as to the origin and home of the Aryan family should be rife; but it will still more conduce to our eventual knowledge of this most interesting question if it be consistently borne in mind that they are but speculations." With the latter, no less than the former, opinion I cordially agree. And as in my address on the Aryan cradle-land, in the Anthropological Section, I stated a greater variety of grounds in support of the hypothesis of origin in the Russian steppes than has been elsewhere set forth, I trust that I may be allowed briefly to formulate these reasons, and submit them to discussion.

(1) The Aryans, on our first historical knowledge of them, are in two widely-separated centers,—Transoxiana and Thrace. To Transoxiana as a secondary center of dispersion the Eastern Aryans, and to Thrace as a secondary center of dispersion the Western Aryans, can with more or less clear evidence, or probable inference, be traced from about the fourteenth or perhaps the fifteenth century B.C.; and the mid-region northwest of Transoxiana and northeast of Thrace—and which may be more definitely described as lying between the Caspian and the Euxine, the Ural and the Dnieper, and extending from the forty-fifth to the fiftieth parallel of latitude—suggests itself as a probably primary centre of origin and dispersion.

(2) For the second set of facts to be considered reveal earlier white races from which, if the Aryans originated in this region, they might naturally have descended as a hybrid variety. Such are the facts which connect the Finns of the north, the Khirgiz and Turkomans of the east, and the Alarodians of the south, with that non-Semitic and non-Aryan white stock which have been called by some Allophyllian, but which, borrowing a term recently introduced into geology, may, I

think, be preferably termed Archean; and the facts which make it probable that these white races have from time immemorial met and mingled in the South Russian steppes. Nor, in this connection, must the facts be neglected which make great environmental changes probable in this region at a period possibly synchronous with that of Aryan origins.

(3) In the physical conditions of the steppes characterizing the region above defined there were, and indeed are to this day, as has been especially shown by Dr. Schrader, the conditions necessary for such pastoral tribes as their language shows that the Aryans primitively were; while in the regions between the Dnieper and the Carpathians, and between the Oxus and the Himalayas, the Aryans would, both in their southwestern and southeastern migrations, be at once compelled and invited by the physical conditions encountered to pass at least partially from the pastoral into the agricultural stage.

(4) The Aryan languages present such indications of hybridity as would correspond with such racial intermixture as that supposed; and in the contemporary language of the Finnic groups Prof. de Lacouperie thinks that we may detect survivals of a former language presenting affinities with the general characteristics of Aryan speech.

(5) A fifth set of verifying facts are such links of relationship between the various Aryan languages as geographically spoken in historical times; such links of relationship as appear to postulate a common speech in that very area above indicated, and where an ancient Aryan language still survives along with primitive customs. For such a common speech would have one class of differentiations on the Asiatic and another on the European side, caused by the diverse linguistic reactions of conquered non-Aryan tribes on primitive Aryan speech, or the dialects of it already developed in those great river-partitioned plains.

(6) A further set of verifying facts is to be found in those which lead us more and more to a theory of the derivative origin of the classic civilizations, both of the Western and of the Eastern Aryans. Just as between the Dnieper and the Carpathians, and between the Oxus and the Himalayas, there were such conditions as must have both compelled and invited to pass from the pastoral into a partially agricultural stage, so, in passing southward from each of these regions, the Aryans would come into contact with conditions at once compelling and inviting to pass into a yet higher stage of civilization. And in support of this all the facts may be adduced which are more and more compelling scholars to acknowledge that in pre-existing Oriental civilizations the sources are to be found, not only of the

Hellenic and the Italic, but of the Iranian and the Indian civilizations.

(7) Finally, if the Hellenic civilization and mythology is thus to be mainly derived from a pre-existing Oriental or "Pelasgian" civilization, it is either from such pre-existing civilizations, or from Aryans such as the Kelto-Italiots, migrating northward and southward from Pelasgian Thrace, that the civilization of Western and Northern Europe would, on this hypothesis, be traced; and a vast number of facts appear to make it more probable that the earlier civilization of Northern Europe was derived from the south than that the earlier civilization of Southern Europe was derived from the north.

The three conditions of a true solution of the problem either of Semitic or of Aryan origins appear to be these: First, the locality must be one in which such a new race could have ethnologically, and secondly philologically, arisen as a variety of the Archean stock of white races; and thirdly, it must be such as to make easily possible the historical facts of dispersion and early civilization. And I venture to submit the above set of facts as not inadequately, perhaps, supporting the South Russian "speculation as to the origin and home of the Aryan family."—J. S. STUART GLENNIE, in *Nature*, October 2d, 1890.

MICROSCOPY.[1]

Lumbricus, Egg-Laying, etc.[2]—In spite of many individual variations, the egg-capsules of the various species of *Lumbricus* are, as a rule, readily distinguishable in form, color, and size. Those of *L. fœtidus*, which are laid in and about manure-heaps, are rather regularly fusiform, varying in color from light yellowish to dark brownish olive; they measure on the average about 4–6 by 2–3 millimeters. The albumen is tough and jelly-like, dissolves with difficulty in water, and becomes of a horn-like consistency after the hardening action of reagents. Each capsule contains from ten to sixty ova, of which not more than ten or twelve undergo development, and this number may be reduced to one or two, particularly in the winter season. The capsules of *L. communis* and *L. terrestris* are

[1] Edited by C. O. Whitman, Clark University, Worcester, Mass.

[2] E. B. Wilson. *Journ. Morphology*, III., 3, Dec. 1889.

deposited in earth, usually a few inches below the surface. Those of the first species are irregularly fusiform, and of a brighter yellow color than those of *L. fœtidus;* they measure on the average about 5–7 by 3–5 millimeters. Those of *L. terrestris* are still larger (mean measurements are 6–8 by 4–6 mm.), regularly fusiform, but more swollen and rounded than those of the other species; their color is a dark olive. In both species the albumen has a slimy, mucus-like consistency, and is not greatly hardened by reagents. In *L. terrestris* only one egg develops out of several included in the capsule. *In L. communis two embryos are produced as a rule, and in many cases, though not in all, both arise as twins from a single ovum, as has been described by Kleinenberg.*

Egg-laying seems in special cases to continue throughout the year, though it is most active in the spring and summer months. I have found the capsules of *L. fœtidus* out of doors in nearly every month of the year, but in mid-winter they are only found in decomposing compost heaps where the temperature is maintained at a tolerably high point. The rate of development varies greatly, and depends not only upon the temperature, but also upon the vigor or other internal properties of the individual embryos, for in late stages the embryos in a single capsule are often found in very different stages of advancement. It is therefore impossible to determine the age of the embryo without following its actual development. In laboratory cultures the young worms usually make their escape from the capsule in about two or three weeks.

Development continues for some time after removal of the segmenting ova from the capsule, but pathological changes invariably supervene, however careful the treatment, and I am persuaded that no trustworthy results can be obtained by this method. After making numerous drawings of embryos thus studied, I rejected them all, and relied wholly on the comparative study of specimens examined or preserved immediately after opening the capsules. The results thus obtained, though based on the examination of a very large number of specimens, are necessarily incomplete; but I believe them to be trustworthy as far as they go.

As in so many other cases, periods of quiescence, or "resting stages," alternate with periods of division throughout the cleavage process. In the resting periods the cells are closely pressed together, and their outlines are often hard to see; so that it is well-nigh impossible to interpret some of the stages unless they are studied in the active period. Moreover, the cleavage process varies greatly in the

order of division, which after the first two divisions loses all appearance of regularity. On account of these circumstances the segmenting ova vary widely in appearance, and the process of cleavage thus acquires that apparent irregularity which other observers have found so perplexing. It is now well known, however, that the segmenting ova of various other animals (*e.g.*, Mollusca, Cœlenterata) are likewise subject to considerable variation, which in some cases at any rate is due simply to temporary acceleration or retardation in the divisions of individual cells (No. 53), and probably does not affect the essential character or the end-result of the cleavage.

Preparation of the Embryos of Lumbricus.[3]—The demonstration of the teloblasts of the germ-bands may be effected in the following manner: Take embryos from .5 to .8 mm. long, place them in fresh filtered lemon juice 5 minutes, and then 20 minutes in 1% gold chloride; and then, for reduction, in a mixture of one part formic acid and four parts water (in daylight). After one or two hours the embryos become reddened and quite soft. They are then to be placed on a slide, the dorsal body-wall torn off, and the isolated ventral wall so placed that its outer surface faces upward. Examined in water, the teloblasts and cell-rows are seen with great distinctness.

For finer purposes the foregoing method is not to be used. It is better to use Flemming's chrom-osmiuo-acetic acid. The embryos remain in this a few minutes, and are then removed to a ⅓% solution of platinum chloride for twice or three times as long. After such treatment surface preparations are best examined in glycerine. Preparations for sections are stained in aqueous hæmotoxylin.

For demonstrating the median ventral plexus of nerve cells, the treatment with lemon juice and gold chloride is followed, except that the reduction is effected in very dilute acetic instead of formic acid (in daylight). After two days (in winter) the embryos are violet colored, and may then be hardened in alcohol (in the dark), and prepared for the microtome in the usual way. In quite young embryos, the epidermis, neural plates, and muscle plates appear clear, and only the nerve cells are stained dark violet.

[3] R. S. Bergh. *Zeitschr. f. wiss. Zool.*, L., 3, Sept. 1890, pp. 474-5 and 484.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Biological Society of Washington—Meeting October 18, 1890.—Mr. H. E. Van Deman, speaking on cultivated fruits in the mountains of North Carolina, said that while scarcely anything had been done in fruit raising for commercial purposes, he believed it would be a profitable investment. Even with the shiftless and slovenly manner of cultivation now in vogue, it was successful. At an altitude of from 2,000 to 3,800 feet the climate is suitable for the growth of apples, and those raised are as fine and keep as well as any grown in the northern States. The flora at the elevation stated being similar to that of New England, he thought the inference fair that fruits succeeding in one place would also succeed in the other. Peaches did not do very well; but the pear, quince, grape, currant, and other northern fruits, he believed could be raised successfully and profitably.

Dr. D. E. Salmon, in discussing the paper, referred to his experience in the region some years ago, and seemed to be rather doubtful that fruit could be successfully raised. The sudden changes from warm to cold often caused a failure in crops, especially with peaches. These last frequently bloom in February, and then the March frosts are fatal to the crop. He did not find the soil as fertile as had been depicted —rather the contrary; and altogether his picture of the beauties of western North Carolina was not as enticing as that of Mr. Van Deman.

Dr. Theodore Gill spoke upon the characteristics of a new family of fishes, the Cyclopteroidea. He referred to the genus Cyclopterus, commonly known as the lump-fish, as having been placed in several different positions in schemes of classification. All the earlier writers had given it a wrong position, and it was only in 1872 that Professor Putnam had placed it where it properly belonged, namely, near the Cottidæ. This Dr. Gill believed to be its true position. Examination of its osseous structure, its nervous system, its digestive system, and other points, all show its near alliance with the Cottidæ, instead of with the Gobiidæ, Gadidæ, or Pleuronectidæ. He gave an outline of the anatomy of the genus, and compared it with other forms, stating his conclusion that its structure showed it to be entitled to rank as the type of a superfamily, which he had named Cyclopteroidea.

Prof. Lester F. Ward spoke on the American Triassic Flora. The best development of this series of strata is found in the Connecticut valley, where great numbers of tracks, formerly supposed to be birds,

but now generally referred to reptiles, have been found. Only a few plants are known from this region. This series of rocks extends through New Jersey and Pennsylvania to Virginia and North Carolina. An outcrop of rocks, presumably of this age, is now known on the Potomac, about twenty miles from Washington. From this point the series passes passes south in a narrow belt, ten or fifteen miles wide, as far as Charlottesville, and is thought to be connected with the Richmond coal field, also Triassic in age. This coal field has yielded many species of fossil plants. They were collected by Rogers, Lyell, Emmons, and others, but no very systematic study has been given the field until recently. Rogers referred the beds to the Oolite of Yorkshire; Emmons referred them to the Permian; Fontaine, within a few years, placed them in the Rhætic, somewhere between the Triassic and Jurassic. The view of Cope, and the one toward which Prof. Ward inclines, is that the Richmond beds, the North Carolina beds, and those of the Connecticut River, really are all of Triassic age, and equivalent to the Keuper group, the upper member of the Triassic in Europe. The total number of plants known from the horizon in North America is comprised in 51 genera and 119 species. These are distributed as follows:

	Genus.	Species.
Problematical organisms, ...	5	9
Ferns, ...	16	36
Equisetaceæ, ...	2	8
Lycopodaceæ, ...	1	1
Cycadaceæ, ...	12	35
Coniferæ, ...	8	19
Monocotyledons, ...	2	2
Doubtful, ...	5	9

The Triassic area is divided into five basins, viz., the Connecticut valley, New Jersey and Pennsylvania, Virginia, North Carolina, and the western area. The species are distributed as follows:

	Total number.	Peculiar to each.
Connecticut River Valley, . .	23	13
New Jersey and Pennsylvania,	18	5
Virginia, ...	56	34
North Carolina, ...	52	25
Western area, ...	13	11

About one-half the number found in the United States occur also in Europe, the largest number of identical species being in the Rhætic, and the next largest in the Keuper.

Professor Ward referred in some detail to the "Problematical Organisms," mentioning in particular the genus Dendrophycus. This was described by Lesquereux from the Coal Measures. Dr. Newberry has more recently described a second species from the Triassic, very similar to Lesquereux's, and Professor Ward referred to a third species which he intended to describe under the name of *D. shumakeri.* This genus is regarded by Dr. Newberry as of vegetable origin, and while Professor Ward did not express a positive opinion as to its nature, he described the *possible* manner of its origin, assuming it to be an Alga. He argued strongly against the idea that because vegetable or carbonaceous matter is wanting the specimen in question or similar ones could not be plants. A discussion of the paper was reserved for the next meeting.—J. F. JAMES.

American Association for the Advancement of Science.—At the Indianapolis meeting the following officers were chosen for the ensuing year:

President: Albert B. Prescott, Ann Arbor, Mich.

Vice-Presidents: A (Mathematics and Astronomy), E. W. Hyde, Cincinnati, Ohio; B (Physics), F. E. Nipher, St. Louis; C (Chemistry), R. C. Kedzie, Agricultural College, Mich.; D (Mechanical Science and Engineering), Thomas Gray, Terre Haute; E (Geology and Geography), J. J. Stevenson, New York; F (Biology), J. M. Coulter, Crawfordsville, Ind.; H (Anthropology), Joseph Jastrow, Madison, Wis.; I (Economic Science and Statistics), Edmund J. James, Philadelphia.

Permanent Secretary: F. W. Putnam, Cambridge, Mass.

General Secretary: Harvey W. Wiley, Washington, D. C.

Secretary of the Council: A. W. Butler, Brookville, Ind.

Auditors: Henry Wheatland, Salem, Mass.; Thomas Meehan, Germantown, Pa.

Treasurer: William Lilly, Mauch Chunk, Pa.

Proceedings of the Natural Science Association of Staten Island.—October 9th, 1890. Mr. Davis exhibited an egg of the black and white creeper, and read the following memorandum in connection with it:

On the 30th of last May, while in the woods to the northwest of Richmond village, in company with Mr. Leng, I observed a black and white creeper (*Mniotilta varia*) hopping down a tree trunk and holding a caterpillar in her bill. Within a yard of the base of the tree, and well hidden in a close clump of beech sprouts and dead leaves,

was the nest, containing two young. Later in the day I found another nest near the base of a tree, which was concealed by dead leaves only, being nearly covered by them. A dead branch served as an arch or doorway to the nest, which contained three eggs. These nests were made of dead leaves, strips of bark and grass, and were lined with rootlets intermingled with a very few hairs. Woodland brooks abound in soft mossy masses of roots that are put forth by the trees growing near their beds, and it is probable that the supply of nest lining was procured from the stream near by. Mr. Samuels says in his "Oology of New England Birds," that the nest is "lined with cotton from ferns, soft grass, or hair." Nuttall, in the description of the nest found by him, says, "the lining was made of a thin layer of black hair." Black and white creepers have several times been observed throughout the summer on the Island, but they were particularly numerous during the one just past, and this is the first recorded instance of the nest having been found here.

A specimen of *Lymnæa palustris* was presented by Mr. Davis, with the following memorandum:

A species of fresh-water snail was collected some years ago in the brooks flowing into Old Place creek. It was quite plentiful there. The past spring a specimen was handed to Mr. Sanderson Smith, who pronounced it *Lymnæa palustris*, an addition to the list of Staten Island Mollusca.

The following objects, presented by Mr. Wm. Olliff, were shown: Fragments of a large decorated Indian pot, two celts or skin-scrapers, and several examples of concretions,—all from Tottenville and vicinity. A stone axe, found while digging a trench for gas-pipe on Richmond avenue, Clifton, was presented by Mr. James W. Allen.

Mr. Thomas Craig showed plants of *Lemna trisulca*, an addition to the flora of the Island, found in streams in the Clove Valley. Also *Azolla caroliniana*, from the same locality, where it has evidently become thoroughly established since its introduction there by Mr. Samuel Henshaw in 1885. (See Proceedings for Dec. 11th, 1886.)

The United States National Academy of Sciences.—The Academy met in Boston on November 11th and 12th. The following papers were read: [1]On the Primary Cleavage Products formed in the digestion of the Albuminoid, Gelatin—R. H. Chittenden. [1]On the Classification and Distribution of Stellar Spectra—Edward C. Pickering. On the Relation of Atmospheric Electricity, Magnetic Storms, and Weather Elements to a case of Traumatic Neuralgia—R. Catlin

(introduced by S. Weir Mitchell). [1] On the Growth of Children studied by Galton's method of Percentile Grades—Henry P. Bowditch. [1] On Electrical Oscillations in Air, together with Spectroscopic Study of the motions of Molecules in Electrical Discharges—John Trowbridge. [1] Some considerations regarding Helmholtz's Theory of Dissonance—Charles R. Cross (introduced by F. A. Walker). [2] A Critical Study of a Combined Meter and Yard upon a surface of Gold, the Meter having subdivisions to two millimeters, and the Yard to tenths of inches—W. A. Rogers. On Evaporation as a disturbing Element in the determination of Temperatures—W. A. Rogers. [2] On the use of the Phonograph in the Study of the Languages of the American Indians—J. Walter Fewkes (introduced by Alpheus Hyatt). [1] On the Probable Loss in the Enumeration of the Colored People of the United States at the Census of 1870—Francis A. Walker. On the Capture of Periodic Comets by Jupiter—H. A. Newton. On the Proteids of the Oat Kernel—Thomas B. Osborne (introduced by S. W. Johnson). On the Present Aspect of the Problems concerning Lexell's Comet—S. C. Chandler. [2] The Great Falls Coal Field, Montana; its Geological Age and Relations—J. S. Newberry. Notes on the Separation of the Oxides in Cerite, Samarskite and Gadolinite—Wolcott Gibbs. On the Relationships of the Cyclopteroidea—Theo. Gill. On the Origin of Electro-Magnetic Waves—Amos E. Dolbear (introduced by John Trowbridge).

[1] Read November 11th. [2] Read November 12th.

SCIENTIFIC NEWS.

John Rafs, a student of the Desmids, died at Penzance, July 14, aged eighty-three years.

Dr. L. W. Schaufuss, the entomologist, died July 19, at Dresden, Germany.

Dr. Alexander von Bunge, formerly Professor of Botany at Dorpat, died in Livland, July 18, aged eighty-seven years.

Peter Maasen, a lepidopterist of Dusselforf, who has made a specialty of the Saturniidæ, died August 18.

The Society of Physics and of Natural History of Geneva celebrated the one hundredth anniversary of its foundation October 23.

Alfonse Farre, formerly Professor of Geology in Geneva, is dead at the age of seventy-seven years.

Dr. A. Müller, formerly Professor of Mineralogy and Geology in the University of Basel, died July 3.

W. Kitchen Parker, the well-known anatomist of London, died in that city, July 3, aged sixty-seven years.

Dr. Ernst Weiss, the author of a work upon the plants of the Carboniferous, died in Berlin, July 4.

Dr. W. Waagen, of Prague, has been called to the chair of Geology in the University of Vienna as successor to the late Prof. M. Newmayer.

E. Ray Lankester has been made ordinary Professor of Zoology in the University of London.

Dr. Carl Chun, of Königsberg, has been called to the University of Breslau, as successor to Prof. A. Schneider.

D. Oliver has resigned the directorship of the Kew Herbarium. His assistant, J. G. Baker, has been promoted to the place thus left vacant.

Sir Warrington W. Smith, the geologist, died in London, June 19, aged seventy-three years.

Prof. St. George Mivart has been elected Professor of the Philosophy of Natural History in the University of Louvain.

Mr. G. C. Bourne has resigned his position as Director of the Marine Biological Laboratory at Plymouth, England.

The Abbe S. A. Marseul died in Paris, April 16, 1890, in his seventy-ninth year.

Professor Franklin C. Hill, D.Sc., Ph.D., Curator of the E. M. Biological Museum, Princeton, died recently of heart-disease. Professor Hill, who was sixty-three years old, was educated at his father's private school in Philadelphia. He also studied medicine there, and after graduation entered Harvard, where he studied engineering, graduating there.

"In loving memory of Frances Evans, daughter of Joseph Phelps (of the island of Madeira), born August 21, 1826; married John Evans July 23, 1859; died at Nash Mills, Hemel Hempstead, September ber 22, 1890."

These are the simple but touching lines of the mourning card telling us of the death of a loving wife and the loss and grief of an affectionate husband. Prehistoric anthropological science has met a loss in her death not indicated in the notice, and which merits more than the formal announcement.

Mr. John Evans is well known in other countries than his own; but the nearer his home the more his worth is recognized. He is a self-made man, has made a fortune by his own exertions and ability, and has as well made a name in science. He is numismatist, geologist, archæologist, anthropologist, and geographer, and occupies a high position in these societies in Great Britain. He is author of the leading works on the prehistoric implements and objects of stone and bronze of Great Britain. His house is a museum and library combined, and is filled with rare and costly specimens. It is also a home, one of elegance and luxury, and here reigned as queen the subject of this sketch. How much of the scientific attainments of Mr. John Evans was due to the aid, counsel, and encouragement of his wife no one but he can know. She was his partner, helpmeet, assistant; she kept his references, was custodian of his papers, and virtually the curator and keeper of his museum and library. She accompanied him in his many journeys, going everywhere throughout Europe; she listened to and applauded his speeches, and was the comfort and solace of his life. She looked forward with bright anticipations to visiting the United States at the proposed International Geological Congress in 1892. Science has lost more in her death than it knows of. Her bereaved husband has my sincerest condolence and sympathy.—T. W.

Miss Cooper, a daughter of the novelist, James Fenimore Cooper, states that when in Paris she saw a French translation of her father's tale, "The Spy," in which there were several mistakes, but one of them was such that it was almost incredible that any one could possibly have been guilty of it. The residence of Mr. Wharton, one of the characters who figure in the story, is spoken of by the author as "The Locusts." Now, the translator had been evidently ignorant of the circumstance of there being any species of trees bearing this name. Having, therefore, looked out the word in his dictionary, and finding the definition to be given as "les sauterelles" (grasshoppers), thus he rendered it in the text. Presently, however, he came across a paragraph in the novel in which it was stated that a visitor to the house of Mr. Wharton had tied his horse to a locust. Then it might be naturally supposed that the translator would have at once discovered his error. Not a bit of it! His reasoning would appear to have been somewhat on a parity with that of a celebrated countryman of his when he declared that "if the facts do not agree with the theory, so much the worse for the facts." Nevertheless, the writer seems to have been conscious that some explanation was due of so extraordinary a statement as that a horseman had secured his steed to a grasshopper. So he went on to gravely inform his readers that in America these insects grow to an enormous size, and that in this case one of these—dead and stuffed—had been stationed at the door of the mansion for the convenience of visitors on horseback.—*Bookmark.*